

Tanker Mortgage Guarantees Approved

Mortgage guarantees totaling \$730 million have been approved by the U.S. Maritime Administration for construction of seven liquefied natural gas (LNG) tankers at Quincy.

The seven mammoth tankers will be used to transport LNG between Indonesia and Japan under 25-year contracts between Burmah Oil Ltd. and Pertamina, the Indonesian state-owned oil and gas company. They will operate under American registry and will use American crews as required by the U.S. Merchant Marine Act of 1936.

The approval "will assure thousands of jobs for employees at Quincy and Charleston, S.C., for many years to come and (provides) the foundation of a profitable business base for the division,"

David S. Lewis, Chairman and Chief Executive Officer, commented.

"The strong and positive support of the U.S. Government . . . represents an important shot in the arm for the U.S. Merchant Marine crews," Mr. Lewis concluded.

The Maritime Administration's \$730 million commitment under Title XI is not a loan, but rather a loan guarantee similar to the guarantees provided under the FHA-insured and VA-guaranteed mortgage programs.

It was one of a series of similar commitments which have enabled American shipowners to finance construction of expensive new ships through the sale of government-guaranteed bonds and notes. As of Sept. 30, construction of

nearly 5,000 ships had been made possible by government guarantees totaling more than \$4.95 billion which have been issued to companies such as Bethlehem Steel Corp., Galveston Shipbuilding Co., Bath Iron Works Corp., and the American Shipbuilding Co.

There are a great number of federally guaranteed loans and they make possible financing of economic and community development projects as well as FHA-insured and VA-guaranteed mortgages and student loans.

Loans are guaranteed to private borrowers, state and local governments, and businesses. The federal government assumes responsibility for payment of some portion of principal or interest in the event the borrower defaults.

The loans are made for a variety of reasons and include instances where the size or maturity of the borrowings make the loan unsuitable for individual financial institutions without the guarantee, or in areas where the government feels support of business activities is in the public interest.

GD is presently under contract to build 12 LNG tankers. In addition to the seven ships being built for the Indonesia-Japan trade, five tankers are being constructed to transport LNG from Algeria to the United States. The first of these ships, LNG-41, already has had two of its five 120-foot-diameter aluminum containment spheres installed. The ship is scheduled for completion by the middle of this year.

GD World

Vol. 7 No. 1

3

January-February 1977

'Like Threading a Needle'

Quincy Team Fits Sphere into Tanker with Ease

By Alex Piranian

After being baked and bent, machined and welded, and walked and barged, each 120-foot-diameter aluminum sphere coming off the assembly line at Charleston, S.C., has one final ordeal to go through — it has to be lifted.

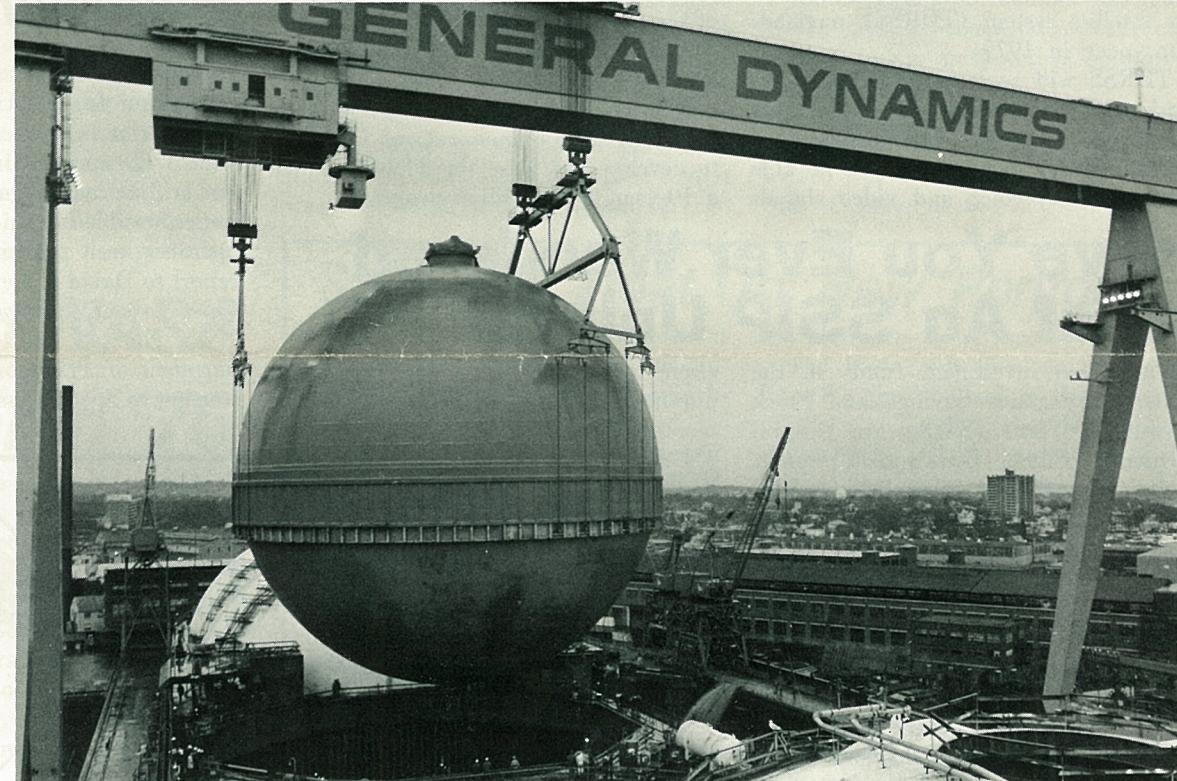
Though lifting a sphere which weighs 850 tons is no easy task, the operation poses no overwhelming problem for the skilled team of Quincy riggers, electricians and crane personnel which is on hand each time Goliath, the largest crane in the Western Hemisphere, fits a sphere into a liquefied natural gas tanker.

Each sphere arrives at Quincy from Charleston, 900 miles to the south, resting on the barge Hercules, and must then be lifted from the barge and placed in the hold of the tanker.

The lift of the first sphere took a mere four hours after James Smith, Goliath's chief operator, positioned the crane's three lifting hooks so they could be attached to a ring around the sphere. From his cab, 260 feet in the air, Mr. Smith controlled Goliath as it hoisted the sphere off the barge as though it were as light as a balloon. Within minutes the huge sphere was slowly gliding through the air alongside the tanker until it was adjacent to Hold No. 3.

Inch by inch, Smith and Goliath then raised the sphere up and over the deck of the tanker and lowered it into the cargo hold — with a mere two inches of clearance to spare.

It was an operation one engineering specialist said was like "threading a needle."



With two inches of clearance.

Full-Scale Development Planned for Convair's Tomahawk

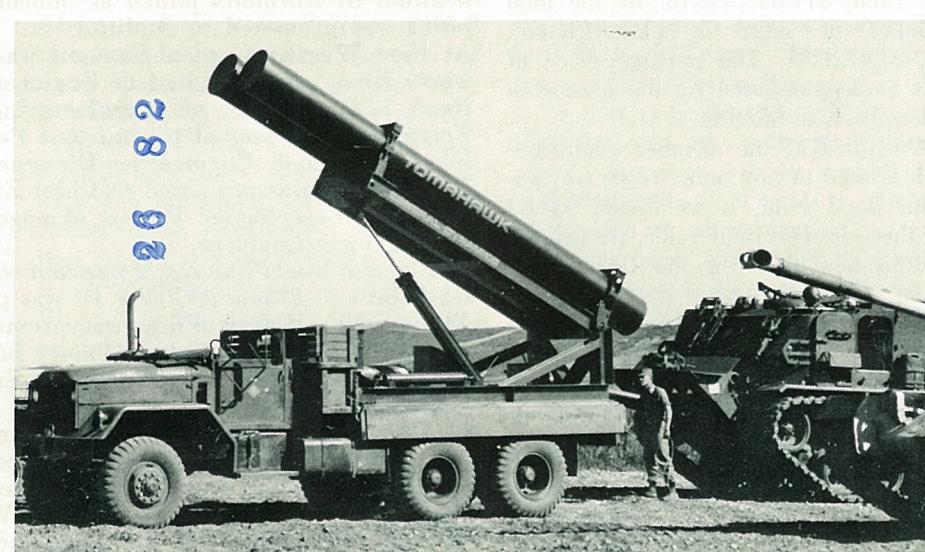
The Department of Defense has awarded a \$19.7 million contract for full-scale development of Convair's Tomahawk cruise missile.

Earlier, following a Defense Systems Acquisition Review Council (DSARC) meeting, the Pentagon said several variants of the Tomahawk would enter full-scale development. The DSARC, which met Jan. 6 in Washington, D.C., directed development of land-attack and antiship Tomahawks to be launched from submarines and surface ships.

The council also directed that a Tomahawk land-attack variant, known as the ground-launched cruise missile (GLCM), be adapted for use in the theater nuclear role.

The U.S. Air Force/Boeing Co. long-range version of the air-launched cruise missile (ALCM) will also enter full-scale development for the B-52 strategic bomber application.

The DSARC, chaired by then Deputy Secretary of Defense William P. Clements Jr., directed that a joint service cruise missile program office be established with the Navy designated as the lead service. Capt. Walter M. Locke, Tomahawk Cruise Missile Project Manager, was selected to head the joint



The Tomahawk ground launch mockup.

office. The new cruise missile program office was charged with submitting plans and schedules for the Tomahawk, ALCM and GLCM.

Ship-launched Tomahawks — both land-attack and antiship — are to have the capability for launch from "all combatant ships including frigates and such smaller platforms as may be attractive to enhance Naval strike capability," ac-

cording to the DSARC announcement.

The Tomahawk cruise missile program has received favorable comments recently from high Navy officials.

In one communication, J. William Middendorf II, then Secretary of the Navy, wrote, the Tomahawk's "near perfect development program to date has compiled a record second to none. . . . We must work and plan for continued

excellence in succeeding test phases of this versatile weapon system which could revolutionize our future defense capabilities."

A successful over-the-horizon search mission flown by the Tomahawk prompted a letter from Vice Adm. Forrest S. Peterson, Commander of the Naval Air Systems Command, which was published in the Pacific Missile Test Center newspaper.

On Dec. 7, the first long-range over-the-horizon antiship search mission test flight of a Tomahawk cruise missile was successfully completed, the admiral noted.

"The planning and execution of the Tomahawk flight from the launch point to target over 200 nautical miles distant was accomplished flawlessly, including subsequent recovery of the missile following the simulated attack on the target," the admiral's letter said.

"This accomplishment is a tribute to the professional expertise of the military-civilian team of personnel which supports the Tomahawk flight test program," it concluded.

The Tomahawk has made 17 validation test flights and logged more than 14 hours of flight time.

Phalanx Tests Begin On Board USS Bigelow

The Phalanx close-in ship defense system developed by Pomona has been installed on the destroyer USS *Bigelow* for reliability and maintainability testing and evaluation of the system's readiness for pilot line production.

The tests will be conducted by U.S. Navy personnel on the Atlantic Fleet Weapons Range in realistic tactical situations.

Phalanx has the ability to react in seconds and then direct a stream of 20-mm. bullets into the target. It has a closed-loop spotting ability which simultaneously measures both the target location and the location of the bullets, and then corrects the difference to zero. The system's autonomous above-deck modular design incorporates the Phalanx's own search, detection, target acquisition and tracking and firing capabilities. It uses a 20-mm. Gatling gun which can fire at a rate of 3,000 rounds per minute.

"The proven quick-reaction capability

of the Phalanx makes it vital to the fleet as a last-ditch defense system against enemy threats," explains John E. McSweeney, Pomona Vice President and Phalanx Program Director.

"This Phalanx was built in the factory, tested by engineering personnel and delivered to the Navy on schedule," Mr. McSweeney said.

Phalanx enters its at-sea operational evaluation as one of the Navy's most comprehensively tested weapons systems.

Since the first contracts were awarded in 1969, Phalanx has successfully completed tests of its feasibility and engineering development and proved its performance in a separate tactical missile test program in which it destroyed both subsonic and supersonic maneuvering drones, which made diving and level attacks.

The new system weighs only 11,000 pounds and can be installed either as a single unit on small patrol boats or in multiples for defense of larger ships.

Reliable Atlas-Centaur Boosters To Launch New Data Satellites

Convair's reliable Atlas-Centaur launch combination is scheduled to boost the first of three tracking and data relay satellite system (TDRSS) payloads into space in 1979.

TDRSS will replace the current network of overseas tracking stations for the National Aeronautics and Space Administration (NASA) and will be able to relay data, voice and video signals

to other spacecraft in earth orbit. The present system of ground stations can provide orbital tracking only 15 percent of the time. When TDRSS is operational, it will be in contact with other spacecraft 85 percent of the time.

The space agency selected the Western Union Space Communications Co., Inc. to develop and lease the TDRSS under a 10-year, \$796 million program.

Have You Ever Wondered What An SSIP Unit Is?

The three investment funds in the General Dynamics Savings and Stock Investment Plans (SSIP) are General Dynamics Stock, Government Bonds, and the Diversified Portfolio accounts. If you are a member of one of the Savings plans and participate in all three funds, then your interest in the General Dynamics Stock is measured by the number of shares, while your interest in the Diversified Portfolio and Government Bonds is measured by the number of "units." The market values of your units and shares multiplied by the number of units and shares you hold will determine the dollar value of your account.

The unit values for the Diversified Portfolio and Government Bonds were set at \$1.00 each when the plan was started. Now the value of a unit for each fund is determined by dividing the fair market values of the assets in the fund by the total number of units.

At the end of each month, the value of each unit is recalculated by the trustee and is published in *GD World*.

Your contribution for that month and the company's contribution will then buy additional units for your amount in the fund at the new price. The number of additional shares of GD stock credited to your account for any given month will be determined by dividing the total of your and the company's contributions to the stock fund by the av-

erage price per share of GD stock purchased by the trustee during that month.

Let's look at how the salaried unit and share values for December 1976 were calculated and see how many units and shares could be purchased by a member who contributed \$100 for December, and whose investment option was one-third Government Bonds, one-third Diversified Portfolio and one-third GD Stock.

As of December 31, 1976, the Salaried SSIP Government Bond fund had a total market value of \$104,696,661.12 and there were 56,029,252.163 units in the fund. Therefore, each unit has a value of \$1.869. The Diversified Portfolio unit value of \$1.330 was calculated by dividing the total market value of the fund, \$77,032,362.18, by the total number of units in the fund, 57,927,422.285. The average price of GD Stock purchased by the trustee in December was \$52.754.

One-third of the member's contribution is used to buy units in the Government Bond fund. If we divide \$33.33 by the December unit value, we will get 17.835 new units in the Government Bond fund.

The number of units bought with the member's December contribution for the Diversified Portfolio fund is calculated by dividing the contribution of \$33.333 by the December unit value of \$1.330 or 25.062 new units in the Diversified Portfolio fund.

The number of shares of GD Stock bought by the member contribution is 0.632 and is determined by dividing \$33.33 by \$52.754.

Now, in addition, the company contributes \$75 to purchase additional units and shares for the employee's account. Of the \$75, \$25 would go to the Bond fund, \$25 would go to the Diversified Portfolio, and \$25 for GD stock. This would result in 13.379 new Bond units, 37.600 new Diversified Portfolio units, and 0.474 share of GD Stock bought with the company contributions.

Savings And Stock Values

The GD Savings and Stock Plan unit values for the month of December are shown below:

Salaried:

Government Bonds	\$1.8686
Diversified Portfolio	1.3298

Hourly:

Government Bonds	1.8676
Diversified Portfolio	1.3361
General Dynamics Stock	53.75

From the Chairman . . .

Equal Employment Opportunity continues to be an integral part of our management philosophy at General Dynamics. We recruit, hire, train and promote persons in all job classifications without regard to race, color, religion, sex, age or national origin, except where sex is a bona fide occupational qualification.

We will base decisions on employment so as to further the principle of equal employment opportunity. We will insure that promotion decisions are in accord with principles of equal employment opportunity by imposing only valid requirements for promotional opportunities. We will insure that all personnel actions such as compensation, benefits, transfers, layoffs, return from layoffs, company sponsored training, education, tuition assistance, social and recreational programs, will be administered without regard to race, color, religion, sex, age or national origin.

As a result of our policy of nondiscrimination, we have made significant progress in increasing our representation of minority group people and women in all of our major job categories. We are committed to specific Affirmative Action goals at each of General Dynamics' principal operations and facilities. We must see that equal opportunity exists in fact as well as in policy. Every applicant and employee must have the same chance for employment and opportunity as any other employee.

Competition is higher today than at any other time in our company's history. Only through the proper utilization of all our employees will we continue to prosper and grow. Equal opportunity, along with other aspects of good management and supervision, will develop good employees.

A successful Affirmative Action program is the responsibility of each and every one of the management team of General Dynamics. I expect to do my part and I expect you and your people to do yours.

D. S. Lewis

Hall Named GD Planning Director

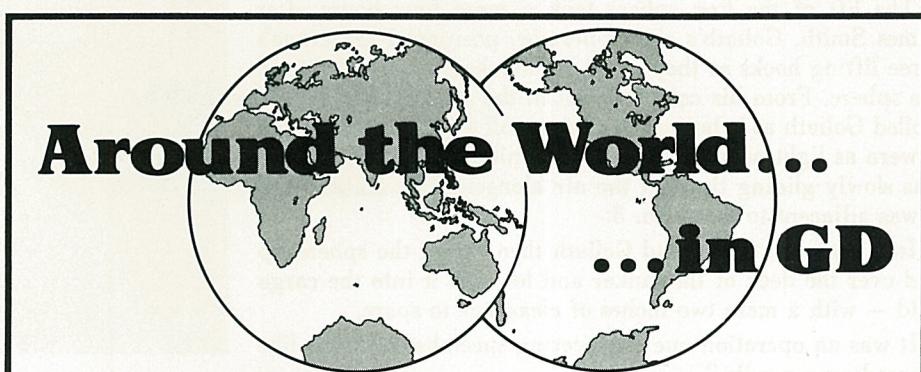
Asaph H. Hall, Federal Railroad Administrator for the U.S. Department of Transportation since 1975, has been named Corporate Director of Planning and will be located in St. Louis. He will be responsible for guiding corporate and operating unit planning efforts and will report to David S. Lewis, Chairman and Chief Executive Officer.

Mr. Hall, 43, has served with the Department of Transportation since 1969, starting as Special Assistant to the Under

Secretary and later serving as Special Assistant to the Secretary.

He began his business career at Westinghouse Electric Corp. serving as an engineer and later Marketing Manager for a number of defense programs.

A former U.S. Army officer, Hall was graduated from Dartmouth College in 1955 with a degree in industrial engineering and business administration and was later awarded a master's degree in the same fields.



At CHQ: Eugene Pickarz joined as Senior Subcontract Auditor . . . Rudi Schleidt, Marketing Manager — Europe, has been appointed Vice President — Programs of the American Businessman's Club in Bonn, West Germany . . . William G. Kormalis joined as Subcontract Auditor . . . Kristine E. Nimpfius was promoted to Auditor.

At Fort Worth: Gordon England was promoted to Project Engineer . . . Larry Hove was promoted to Engineering Program Manager . . . Clarence Raub became Chief of Manufacturing Support Equipment . . . Clifford Verwers was promoted to Assistant Project Engineer . . . D. Randall Kent has been named Engineering Director — Engineering Flight Test . . . Neil R. Anderson was promoted to Chief Experimental Test Pilot . . . R. P. Andrews has been named Project Manager . . . W. C. Malloy has been named Chief Project Engineer.

At Electric Boat: Edward Morenzone was promoted to Superintendent, Quonset Point . . . Edmund Cleary Jr. was promoted to Chief of Test.

At Convair: Robert White was promoted to Program Manager, LVP . . . Edward Hujak and Walter Mooney both rejoined as Systems Project Engineer . . . Leo Kaszas was promoted to Engineering Chief (Stability and Flight Control).

At DSS: William Horan was promoted to Manager, Operations at WDSC . . . Monica Carr was promoted to Production Control Analyst, DSS Home Office . . . James Savage was promoted to Corporate-Wide Applications Specialist, DSS, and transferred from WDSC to the Home Office.

At S-C: Mark O'Donnell was promoted to Staff Accountant and transferred to CHQ.

At Pomona: Tun Man Lee joined as Design Specialist . . . Robert Earle was promoted to Design Specialist . . . Howard Maculay became Manager of Management Information Systems . . . Adrian Messner joined as Design Specialist . . . Conrad L. Wilcoxson was promoted to Project Engineer . . . H. L. Robinson joined as Design Specialist . . . L. E. Byington was promoted to Design Specialist . . . F. Constant was promoted to Assistant Project Engineer . . . J. L. Warde was promoted to Marketing Representative . . . H. W. Johnson was promoted to Production Manager — Camden . . . A. J. Puntous was promoted to Plant Engineering Supervisor.

At Electronics: Stuart Malmgren joined as Manager of Marketing, Tactical Data Systems.

At Material Service: Gene C. Marter was promoted to General Sales Manager.

Giant Pontoon Installed with Planning and Teamwork

By Jim Reyburn

What's it like eyeballing a 5,500-ton floating platform about the length of a pair of football fields laid end-to-end into an opening only 18 inches wider.

"Very exacting," admits Electric Boat division's Chief Pilot Chuck Osborne, who in December had a hand in directing the installation of the huge 500- by 100-foot launch pontoon into the graving dock basin of the shipyard's new Land Level Submarine Construction facility.

Taking part in the six-hour operation were about 100 EB employees—riggers, carpenters, divers, maintenance people, surveyors, docking engineers and planning personnel—four tugs, two small outboard skiffs, a number of walkie-talkies and three capstans.

The running gear used reads like an inventory of a well-stocked marine rigger's loft: 2,000 feet of 4.5-inch nylon line, 360 feet of chain and 1,500 feet of assorted sizes of wire cable.

The event unfolded this way: With the thermometer nudging two below zero in 6 a.m. darkness, the tugs eased the pontoon on a rising tide, from its temporary berth into a multipoint moor off the end of the basin, which was set to align the pontoon for its entrance.

The moor had been placed four days earlier under Osborne's direction by a 16 person rigger crew hand-picked and supervised by Rigger General Foreman Dick Rolfe.

Standing with Mr. Osborne at the after-end of the pontoon were Tom Keel, EB Facilities Planning Manager, who had overall responsibility for the pontoon project, and Bill Weisert, superintendent of docks, who had overall responsibility for the installation.

GD's Convair Helped NASA Record a Perfect Year in '76

Convair division's Atlas launch vehicles and Centaur high-energy boosters played prominent roles in the perfect score of 16 successful launches in 1976 recorded by the National Aeronautics and Space Administration (NASA).

During the past year, Atlas and Centaur combined to boost three communications satellites into synchronous orbit, and Centaur teamed with the Titan IIIE launch vehicle to send the second Helios

Service Awards

35 Years

Operations—R. J. Larson, H. A. Ostin, W. L. Dueber, J. E. McCann, D. K. Gingery, R. W. Chambers, P. P. Standley, G. C. Lang, Y. Z. Morris Jr., J. A. Ross, B. Flores, K. Phillips, V. P. Mavrinac, V. A. Contreras, J. C. Duffy, M. M. McCaskey, B. Luffe.

Contracts—I. U. Eggert Jr.

Research and Engineering—S. Pauchnick, M. M. Parker, C. J. Rezek, S. E. Beemer.

Reliability—C. E. Boyd, L. I. Fredrickson, F. L. Miller.

Industrial Relations—M. J. Chilcote.

Material—C. F. Lewallen, N. Grand, J. H. Maloney, P. H. O'Dell.

Launch Vehicle Programs—G. W. Cooper.

GD World

Published by General Dynamics Corporation, Pierre Laclede Center, St. Louis, Mo. 63105

G. Alexander Smith—Manager of internal communication

Fred Bettinger, Jack Isabel—Contributing editors, Convair Edition

With the Electric Boat tug *Hackensack* pushing from astern and the remaining tugs on the sides, the pontoon edged ahead and nestled against fenders at the end of the basin's sides. Riggers attached a 600-foot headline and breast lines (side lines) that would keep the pontoon aligned as it moved in with only nine inches clearance on each side.

With all lines in place, Osborne turned over direction of the docking to Dan Koerner, EB's docking engineer.

It was 9:30 a.m. The first moment of truth had arrived. With a signal from Mr. Koerner through Osborne, Bill Kelsey, skipper of the *Hackensack*, rang up "dead slow ahead." The massive platform inched forward for its entrance as onlookers strained for a better view.

Ten minutes later, it became clear that the haunches, or legs, on the sides of the pontoon would not clear the first two of 48 haunch pads, or concrete columns, on the sides of the dock. When the legs rest on the top of the pads, the top of the pontoon is level with the platform on either side of the basin. The clearance problem had been anticipated, and the crew simply secured their charge to wait for the tide to rise a few more inches.

It didn't take long. A half hour later, with wet-suited divers checking clearance on either side of the forward end of the pontoon, *Hackensack* again began her gentle nudging.

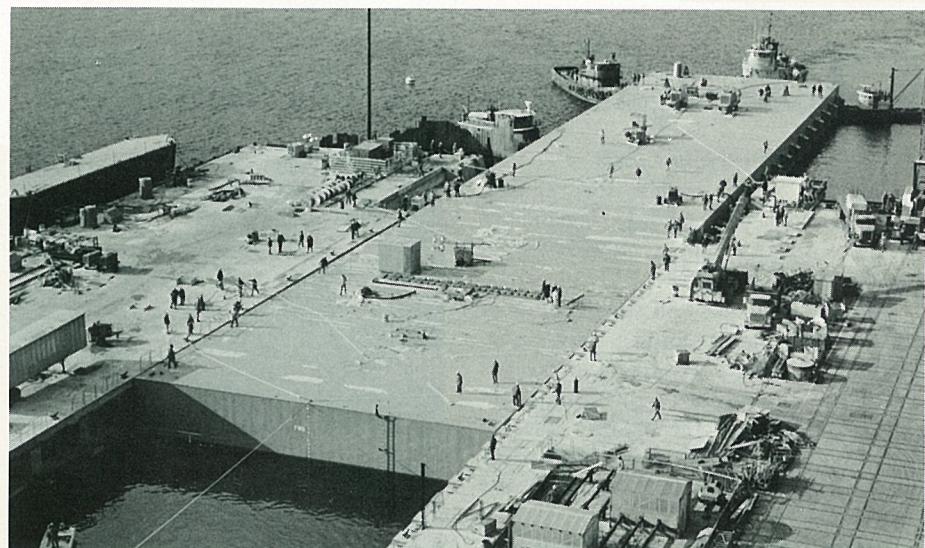
Skittering around ahead of the pontoon in the basin, the two skiffs made last-minute clearance checks. Later, they were lifted from the basin by a crane.

The pontoon kept advancing, closing the 600-foot gap, as the crew moved back and forth on her deck to adjust

the breast lines.

At 11:45 a.m., workers on the platforms on each side of the basin attached grip hoists near the forward end, and, by noon, had eased the pontoon the few remaining feet home. One of the key components in the shipyard's \$140 million modernization program was in place, without a scratch, ready for in-basin testing.

Later, at his desk in the deckmaster's office, Osborne, obviously pleased, talked about the move. "What impressed me most about the whole thing," he said, "is the way so many people from so many different shipyard disciplines pitched in. They were real pros and it was a great thing to be a part of."



Big Move. Guided by four tugs and a winched headline (lower left), a huge 500- by 100-foot launch pontoon inches into a graving dock at Electric Boat division during installation on Dec. 14. The 5,500-ton pontoon, a key component of the shipyard's new \$140 million Land Level Submarine Construction facility, will be used as a launch platform for nuclear submarines.

the breast lines.

At 11:45 a.m., workers on the platforms on each side of the basin attached grip hoists near the forward end, and, by noon, had eased the pontoon the few remaining feet home. One of the key components in the shipyard's \$140 million modernization program was in place, without a scratch, ready for in-basin testing.

Later, at his desk in the deckmaster's office, Osborne, obviously pleased, talked about the move. "What impressed me most about the whole thing," he said, "is the way so many people from so many different shipyard disciplines pitched in. They were real pros and it was a great thing to be a part of."

Mr. Koerner echoed these sentiments: "We never figured there were going to be any problems. After an all-hands planning meeting the day before, everyone knew what he was supposed to do, and he did it. It went very well."

Both were glad to have the job over because of the pressures involved. "There were two overriding pressures," Osborne explained. "First, that pontoon is one of a kind—there's not another one like it in the world. Second, it's worth eight million dollars as is and a lot more to the submarine program."

Osborne glanced toward the pontoon and smiled. "It's not the biggest thing we've ever been involved in moving, but it's one of the most important."

Subs Will Float Off New Pontoon

The use of the launch pontoon at Electric Boat division will inaugurate an additional method of launching submarines at the shipyard.

When a ship is ready for launching, it will be moved sideways off the adjacent land level platform onto the pontoon on electric motor driven transfer cars. The pontoon is resting on concrete columns, or haunch pads, on the sides of the dock. The graving dock basin will then be flooded to allow the pontoon to float off the haunch pads that hold it level with

the platforms along the sides.

The basin will then be emptied, lowering the pontoon to the bottom of the graving dock. For launching, the pontoon will be flooded and will rest on the bottom of the basin. As the basin is reflooded, the ship will float free.

In the traditional method, which will also continue to be used at EB, submarines are launched from inclined building ways and slide into the Thames River after being released by a trigger.

Telephone Switchboards Consolidated in San Diego

The first phase of a two-stage consolidation of telephone switchboards will go into effect at Kearny Mesa and Lindbergh Field in early February.

According to Bill Wise, Manager of Plant Services, all Lindbergh Field telephone extensions will be converted to numbers in the 4000 series to eliminate duplication at other plants. Conversion lists have been distributed to identify old and new extensions at the Lindbergh Field plant, Plant 19 and the Harbor Drive Test facility.

The second phase of the consolidation will go into effect later this winter when the Lindbergh Field switchboard will close and all incoming calls to the old number, 296-6611, will be directed to the Kearny Mesa number, 277-8900.

Mr. Wise says Pacific Telephone will refer all incoming calls to the new number, but urges that employees notify those outside the company who call frequently about the number change.

The Electronics division has already installed a new Stromberg-Carlson telephone system. Prior to the Electronics change, the division was serviced through the Kearny Mesa switchboard and the changeover has freed several positions at Kearny Mesa to accommodate the new Lindbergh Field extension numbers.

Although the incoming telephone number for Electronics remains 279-7301, some new extension numbers have been assigned. To reach Electronics from Kearny Mesa, dial 87 plus the extension. Those calling Electronics from Lindbergh Field should dial 587 plus the extension.

The emergency number of Lindbergh Field, Plant 19, and Harbor Drive Test facility is 4555. The emergency number of Kearny Mesa remains 1555.

Theisen Elected To Board of IEEE

Russell Theisen, Electronics division project engineer responsible for computer applications and automatic test systems in Orlando, has been elected to serve on the 1977-78 Board of Governors of the Computer Society of the Institute of Electrical and Electronics Engineers (IEEE).

Mr. Theisen has held numerous professional offices in the IEEE at local and regional levels, including the office of Southeastern Area Chairman and Committeeman on the IEEE Executive Board and Executive Committee of the Orlando section of Region III.

Spotlight

Clumping Through an Asbestos Mine

By Patricia Lewis

There I was: muddy, bedraggled, tired, bruised and slightly bewildered by the entire operation. How HAD all this happened to ME?

Imagine someone who spends most of her working time behind a desk in St. Louis, who smokes a pack of cigarettes a day and who has no engineering background. Imagine someone who likes to be clean, who doesn't particularly like the dark and who jumps a mile at any loud noise.

You are not imagining the most suitable candidate to visit an asbestos mine.

However . . .

One does as one is told, and last fall, I was told to pack some long underwear and get myself to the hinterlands — namely, Thetford Mines in Quebec Province, Canada, where Asbestos Corp. Ltd. has a mine. I was to work on a project for asbestos miners. The extent of my knowledge about asbestos was that it made dandy firemen's clothing.

So, I visited Sears, Roebuck & Co. to find some very warm, very sturdy, long underwear; got on an airplane; flew to Montreal and drove through an early blizzard to reach Thetford Mines, a town of nearly 22,000 people about 170 miles east of Montreal.

The day after the blizzard broke nice and clear but *cold*. The temperature was zero degrees and there was a brisk wind — but I was prepared.

My guide for the tour of the underground asbestos mine was an assistant to the superintendent at the King-Beaver mine, one of the five operated by Asbestos Corp. Regarding my bundled appearance, he explained that since the temperature in the mine remains a constant 55 degrees, I would hardly need the layers of clothing I was wearing to guard against frostbite.

By the time I had removed most of my cold weather clothing and was beginning to again assume the shape of something other than a bear gone amok in a laundry, my guide, René Brunet, handed me the gear I needed to wear for my tour.

I did not look like a page in *Vogue*; I did look like a miner. I felt awful.



Ready for Action. Prior to the 1,100 foot descent into the King-Beaver mines, Patricia Lewis of the Public Affairs department in St. Louis waits for the lift with her guide, René Brunet.

A combination of heavy knee-high boots, each weighing about 20 pounds, with steel-reinforced toes and shanks; chic green coveralls, more or less my size (mostly more); a yellow rope belt with its heavy, awkward battery powering the light hanging around my shoulders and neck, and a green, perky hard hat was my costume for descending.

M. Brunet started off for the head frame, the building over the elevator shaft, at a brisk clip. I clumped along several yards behind him, hard hat tilting to the left, light out of control and boots getting heavier with each clump I took.

We descended. We walked through mud. We walked through water. We walked over train tracks. I learned that the tunnels yielding asbestos are called drifts. We walked up drifts, down drifts and through drifts.

Editor's note: Asbestos Corp., Ltd., our Canadian subsidiary, uses both deep mining and open pit mining techniques to extract asbestos ore from the earth.

Last fall, Pat Lewis, from the

I panted.

We also climbed ladders.

"Do you mind climbing ladders?" Brunet had asked.

I, thinking about changing lightbulbs, cleaning gutters and retrieving stuck kites from trees, had no objections.

Climbing a ladder up a shaft in an asbestos mine bears no resemblance to climbing a stepladder to change a lightbulb. None. Mine ladders are straight up and down. They do not have steps, and they seem about 40 umpteen million feet high. I had no time to think. Brunet had all but disappeared. (Climbing up, I discovered later, was a piece of cake compared to coming down.)

We were finally in the area of production work. There were teams of miners digging asbestos using different types of drills. Brunet explained the activity to me using layman's terms. Then, sud-

Public Affairs office in St. Louis, was sent to Thetford Mines in Quebec, and Pete Autio, a photographer from Convair division, was sent to Asbestos Hill.

Here are their impressions.



denly he motioned me to cover my ears.

There I stood in my hat, boots and coveralls, in mud, with my hands over my ears wondering if this was a new game called "let's see how long she stands there before she feels foolish."

I didn't wonder too long. A roar, a trembling of earth and a whoosh of air reached me from another part of the mine. I jumped a mile. It didn't take an Einstein to understand that they had been blasting.

Dynamite is used to loosen more mineral. The blast takes place in an undercut of a draw point, which is an asbestos-rich area in a small tunnel off the drift. The miners then use large shovel-like machines called scrapers to dig out the mineral. The scraper is quite noisy, but can dig out tons of mineral in a day's work. The scraper pushes the asbestos down a chute into a train which takes it to a crusher.

As we were coming out of the drift, we met a group of miners. Although there is an old miner's superstition which prohibits women from entering a mine, this has changed somewhat and, while women do enter, it is still a rarity. There were some skeptical glances and a lot of comments, mostly in the local vernacular which I couldn't understand.

Considering my appearance, and the way I felt, it probably was just as well.

It Takes a Special Breed to Mine Remote Asbestos Hill

By Pete Autio

As my Nordair flight punched through the heavy cloud cover on its final approach to the Asbestos Hill mining site last summer, it was hard to imagine that beneath this barren land was one of the world's richest deposits of asbestos ore.

I had been sent from San Diego to Asbestos Hill late last summer to take some pictures of the operation for the

annual report.

Asbestos Hill is 300 miles south of the Arctic Circle in the Canadian wilderness of the Ungava Peninsula. Deception Bay, on the shores of the Hudson Strait, is about 40 miles to the north and is the shipping point for Ungava's mined ore. The nearest permanent settlement is the Eskimo village at Sugluk, 60 miles to the north of Asbestos Hill.



Loading Asbestos. Front end loaders fill over-the-road dump trucks with the asbestos ore mined at the Asbestos Hill open pit mine in northern Quebec 300 miles from the Arctic Circle.

The Hill, as it is called by the veterans who work there, has the typical Arctic terrain and a climate to match. There are no trees and the ground is bare except for moss, a little grass and an occasional flower that attempts to add some color to an otherwise gray landscape. Strong, biting winds prevail and during the long winter months the temperature plunges to more than 50 degrees below zero.

Asbestos Hill is an open pit mine, created by blasting the asbestos from its rock formations on a series of terraces. The mineral is then loaded into off-the-road dump trucks and hauled to Deception Bay.

Under the supervision of old mine hands like General Manager Sam Luciani and Assistant General Manager Gord Saunders, a special and hardy breed of about 400 men mine and transport the asbestos concentrate to Deception Bay around the clock.

How much asbestos is there in the Hill? "It's estimated approximately 18 million tons of asbestos ore can be extracted," Mr. Luciani told me. "And, this is high quality ore," he said. "The fiber is well suited for asbestos-cement products."

Luciani and Mr. Saunders showed me the open pit mining operation where huge trucks and their trailers hauling up to 50 tons of asbestos at a time left

for the 40-mile journey to Deception Bay.

"When weather conditions are good that's about a two-hour round trip over a hard-packed road," Saunders said. "When the road is icy, slushy or very muddy from thaw, the trip takes much longer."

Communication with the parent company, Asbestos Corp. Ltd. in Montreal, nearly 1,200 miles south, is by radio-telephone relayed through Frobisher Bay.

The veteran miners of Asbestos Hill live in comfortable prefabricated trailers which dot the landscape around the camp.

Facilities at Deception Bay include a 6,000-foot landing strip, used by the Nordair aircraft to ferry men and materials to the site. There is also a huge warehouse for asbestos and fuel storage and a landing pier for ships. Ships are loaded with asbestos concentrate at the bay for the voyage to Nordenham, West Germany, where the concentrate is refined.

Because of ice jams, shipping from Deception Bay is limited to 10-12 weeks out of the year, from mid-July to mid-October. However, the mining operation at the Hill continues year around, and the concentrate is stored in the huge warehouse until the shipping lanes open up.

GD Kicks Off 1977 U. S. Savings Bond Drive

The 1977 U.S. Savings Bond Campaign will be conducted May 16th to May 27th. During the campaign employees will be able to sign up for the automatic payroll savings plan — or may increase their present participation.

"The percentage of General Dynamics employees participating in the plan

See Related Story Page 2

has been declining over the past few years," says Warren G. Sullivan, GD Vice President for Industrial Relations. "In this year's campaign, we hope to reverse that by letting everyone know what a wise and secure investment savings bonds are."

The Series E bonds may be purchased at a cost of 75 percent of their



face value in a variety of denominations ranging from \$25 to \$10,000. The interest on the bonds accrues at 6 percent when held to maturity at five years. The bonds are convenient to buy since the payroll deduction plan permits

them to be purchased on a partial payment basis each month.

The bonds are safe since they may be replaced at no charge in the event they are lost, stolen or destroyed.

They are also liquid, and they may be

cashed in at any time after two months following the issue date. To receive the 6 percent interest, however, they must be held to maturity. The first year, the bonds earn interest of four-and-a-half percent.

There is also a significant tax advantage in purchasing U.S. Savings Bonds. Earned interest is exempt from all state and local income or personal property taxes. The Federal income tax on the interest may be deferred until the bonds are cashed or are mature.

Perhaps most important of all from an investment security standpoint, there is no market fluctuation with U.S. payroll savings bonds — they are never worth less than the price you pay for them.

43 81 GD World

Vol. 7 No. 3

3

April 1977

GD Had Record Earnings In First Quarter of 1977

At its annual shareholders meeting, GD announced that its first quarter earnings were the highest in history — and represented the 24th consecutive quarter in which earnings exceeded those of the comparable period of the previous year.

Meeting in St. Louis on April 13th, shareholders were told that earnings for the three months ended April 3d, amounted to \$18,904,000, or \$1.73 per share, compared with \$17,243,000, or \$1.59 per share, for the three-month period ended March 28, 1976.

Sales for the first quarter of 1977 were \$678,436,000, compared with \$568,371,000 in the same three months of 1976.

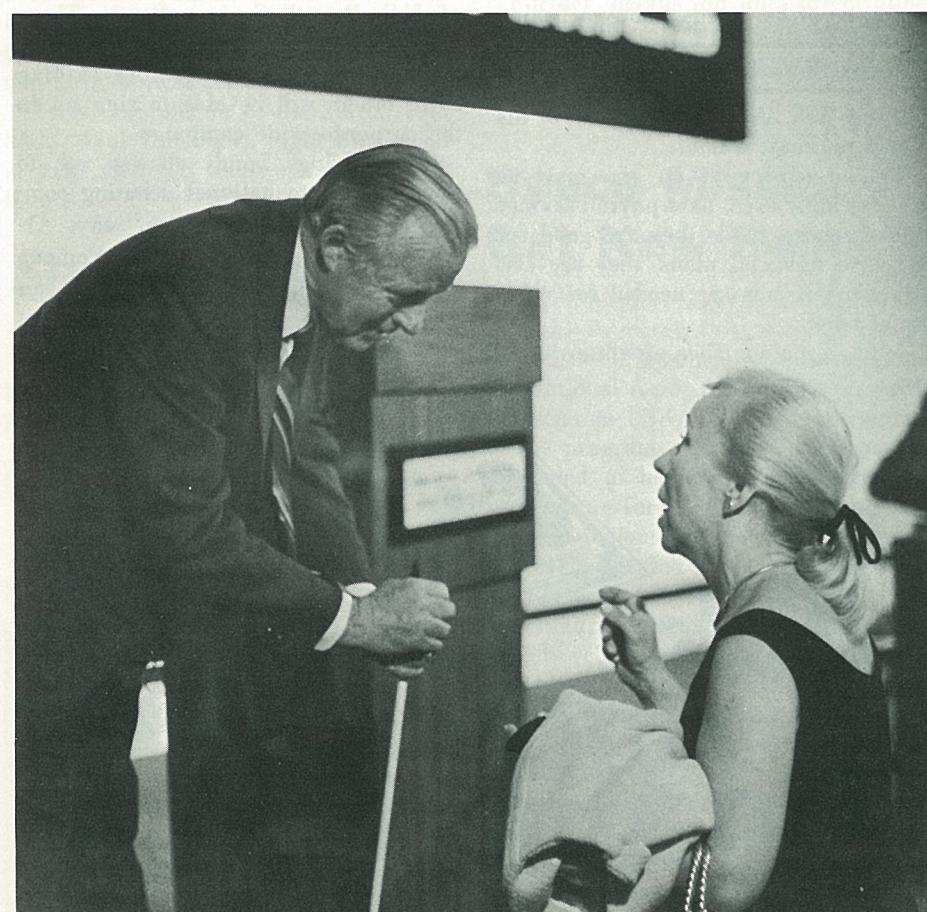
Talking about the increasing financial strength of the corporation, Mr. Lewis noted total debt has been reduced from \$370.6 million in 1971 to \$102.2 million at the end of last year. Over the same period, nearly \$600 million has been spent on new manufacturing facilities, new machinery and equipment and "all of the other things required to improve the efficiency and effectiveness of our operations and take advantage of what we have ahead of us," he said.

Discussing GD's \$6.5 billion backlog, the largest in the company's history, Lewis said that 55 percent is in government business.

"While we all recognize that any government program may be terminated as requirements change, our company does have a number of major defense programs that have a particularly high priority," he said.

He also pointed out that while present planning calls for F-16 contract values totaling between \$10 and \$16 billion dollars, only \$300 million covering initial stages of the program is included in the backlog figures.

"On the negative side, we continue to have our problems with the SSN 688-class submarine construction program at Electric Boat and with the Navy's processing of our claims for very large contract price increases for these ships," Lewis said. "We have been advised that the Navy expects to settle Electric Boat's claims by the end of this year. We must obtain a substantial percentage of our claims as well as make further improvements in our productivity levels at Electric Boat if this major long-term program is not to incur a loss," he said.

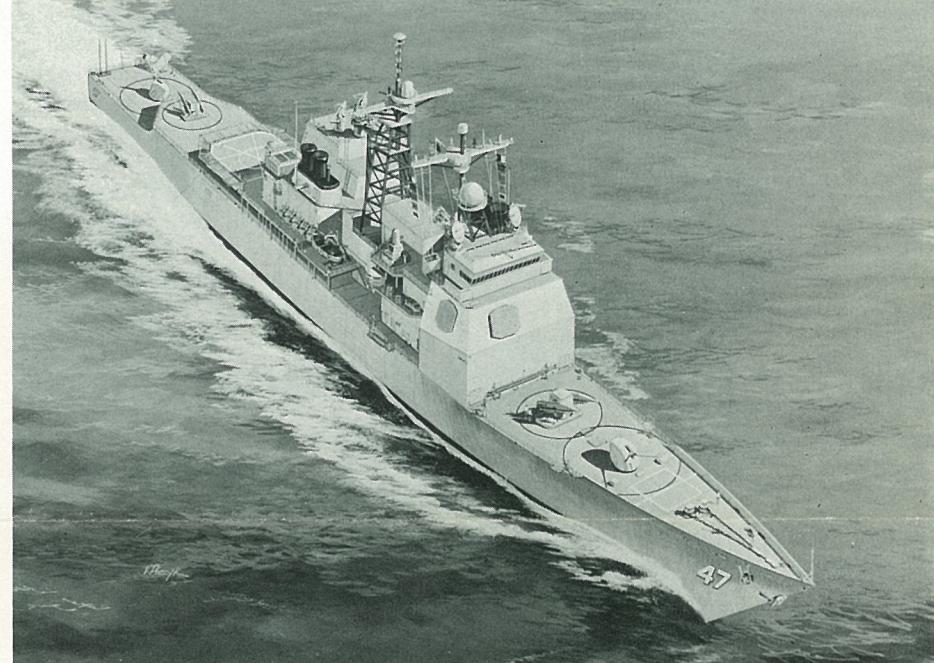


Question for the Chairman. A shareholder at the annual meeting poses her question to David S. Lewis, GD's Chairman and Chief Executive Officer.

Inside the World

Widmer, Hansen Honored Page 2

Capital Expenditures Explained Page 4



Future Destroyer. The new DDG 47-class guided missile destroyers are planned to be the U.S. Navy's general-purpose destroyer of the future.

Destroyer Design Study Contract Awarded to Quincy by U. S. Navy

Quincy Shipbuilding division has been awarded a \$1 million contract by the U.S. Navy for study and analyses of the detail design and construction of DDG 47-class guided missile destroyers.

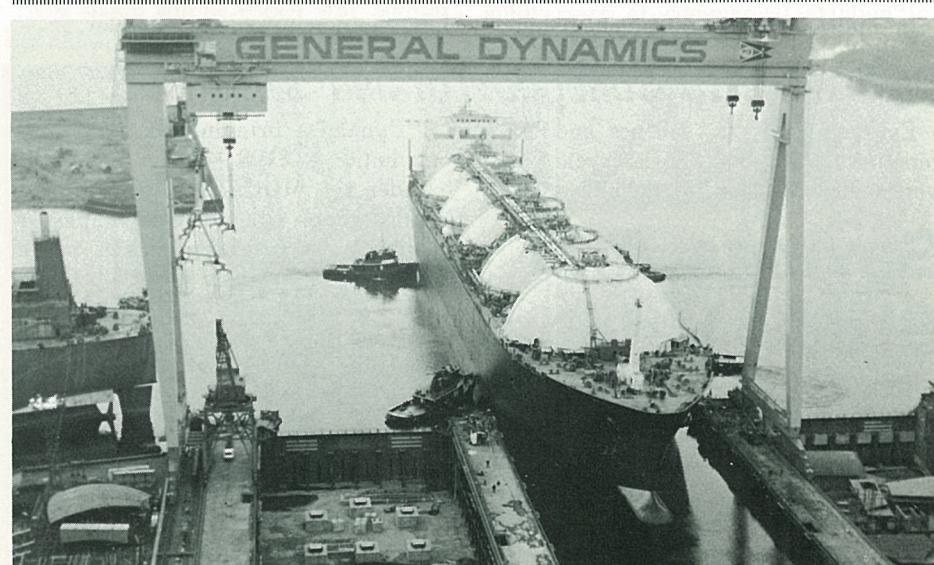
The Navy has announced plans to construct 16 of these destroyers and requested \$970 million for the design and construction of the lead ship.

DDG 47 is a new class of guided missile ship intended to be the Navy's general-purpose destroyer of the future. Primarily equipped for antiair warfare, DDG 47s will also have significant

antisubmarine and surface warfare capability.

The principal armament for the class will be the Aegis MK-7 weapon system, which has the rapid reaction, accuracy and firepower required to counter the antiship-missile threat. The DDG 47 will also be armed with 5-inch guns, lightweight guns, Close-In Weapon Systems, Harpoon, ASROC and air- and surface-launched torpedoes.

The DDG 47 will be powered by four gas turbines and will have maximum commonality with the *Spruance* (DD 963) class hull.



Floating Out. LNG 41, the first of the liquefied natural gas tankers under construction at Quincy Shipbuilding division, floats out for its final outfitting after having its five spheres installed. The tanker will be ready for its naming ceremony later this year.

Convair Wins Superconducting Magnet Contract

By Jack Isabel

Convair has won a key development program to design and build a large superconducting magnet for the U.S. Energy Research and Development Administration (ERDA) as part of the nation's fusion energy research program.

According to Program Manager Dave Hackley, a letter contract was received from Union Carbide Corp., the operator of ERDA's Oak Ridge National Laboratory in Tennessee where the giant coil will be tested and evaluated along with magnets built by two competing companies.

"Fusion reactors promise an almost limitless amount of energy by duplication of the reactions which take place on the sun," says Mr. Hackley. "To operate a small 'sun' here on Earth requires containing the reaction in a machine that will not be destroyed by the high temperatures involved."

According to Hackley, present plans call for using a very strong magnetic field to essentially suspend the reaction in a near vacuum without any contact with the walls of the containment vessel.

"Conventional electromagnets would likely consume more energy than the reactor itself could produce," he says. "For this reason, scientists are looking to superconducting magnets as the key to efficient operation."

Convair's preliminary design uses more than five miles of conductor, a copper bar with a superconductor cable

in it, to wind the 17-foot high magnet. The coil will be 11 feet wide, 2 feet thick and will weigh about 39 tons. Engineering for the program will be conducted at Kearny Mesa, while manufacturing will take place at Plant 19.

Unlike conventional conductors, such as copper, superconductors, when subjected to very cold temperature, have virtually no resistance to electric current. Once started, current will continue to flow without loss. The Convair magnet is cooled by operating it in a liquid helium bath, which maintains the conductor at 452 degrees below zero Fahrenheit.

Wally Withee, Convair's Director of Energy System's Marketing, says Convair's latest contract win in the energy systems field "makes me very enthusiastic about the future possibilities of this market. Commercial fusion reactors of the future will require up to 20 magnets, each of which will be more than twice the size of the magnet designed for the current program."

In an earlier development by Convair in the energy field, the company built laminated copper coil segments for the centerpost of the Doublet III fusion facility that is under construction at General Atomic Co. in San Diego. The Doublet III fusion machine is scheduled to go into operation next year and is expected to provide data essential to the design of an actual fusion reactor that can produce power.

Prescription Glasses Now Offered

Convair division's safety office will introduce a new one-stop service for

Convair Tomahawk Flies Overland Test

An unarmed U.S. Navy Tomahawk cruise missile successfully completed a test flight from the Naval Weapons Center at China Lake, California, to the Dugway Proving Ground in Utah.

The Convair-built missile was launched from an A-6 aircraft and was escorted throughout the flight, which ended when it circled the test range at Dugway and activated its parachute recovery system.

The flight was the first of several over land flights planned to further verify Tomahawk's ability to navigate over land to a predetermined area.

During the 1-hour and 17-minute flight, the cruise missile was navigated by its Terrain Contour Matching guidance system, which compares the measured terrain heights stored in an onboard computer with actual radar returns and corrects the missile's course and altitude over the route.

At the completion of the March 19th flight, total Tomahawk flight time stood at more than 16 hours obtained in 20 flights.

Service Awards

35 Years

Operations — J. W. Harlow, H. W. Moreno, M. C. Tracy, H. G. Barnes, K. O. Hanson, G. K. Watson.

Research and Engineering — L. A. Burnett.

30 Years

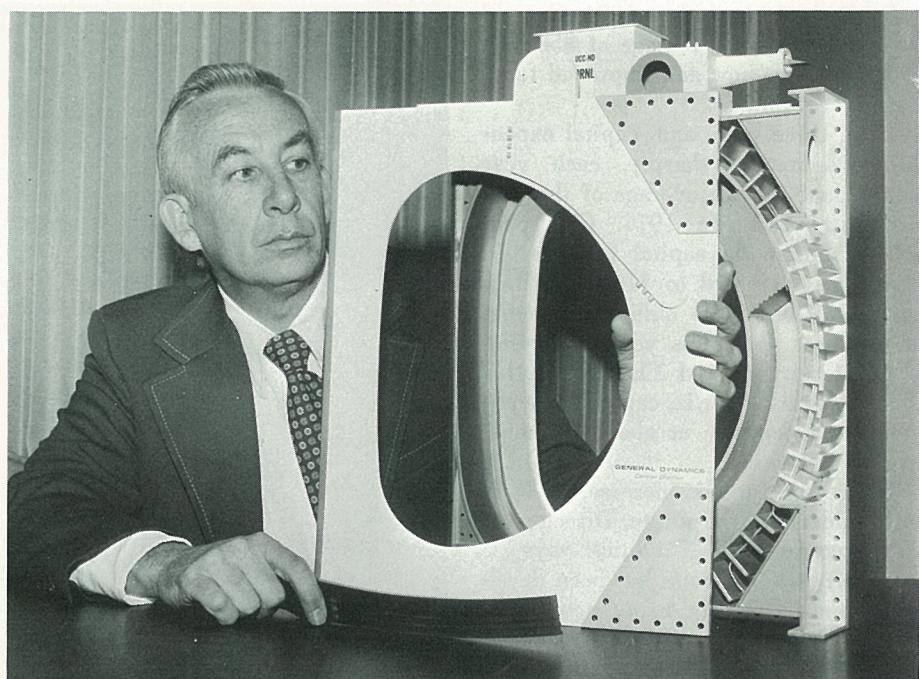
Eastern Test Range — W. A. Schmitz Jr.

GD World

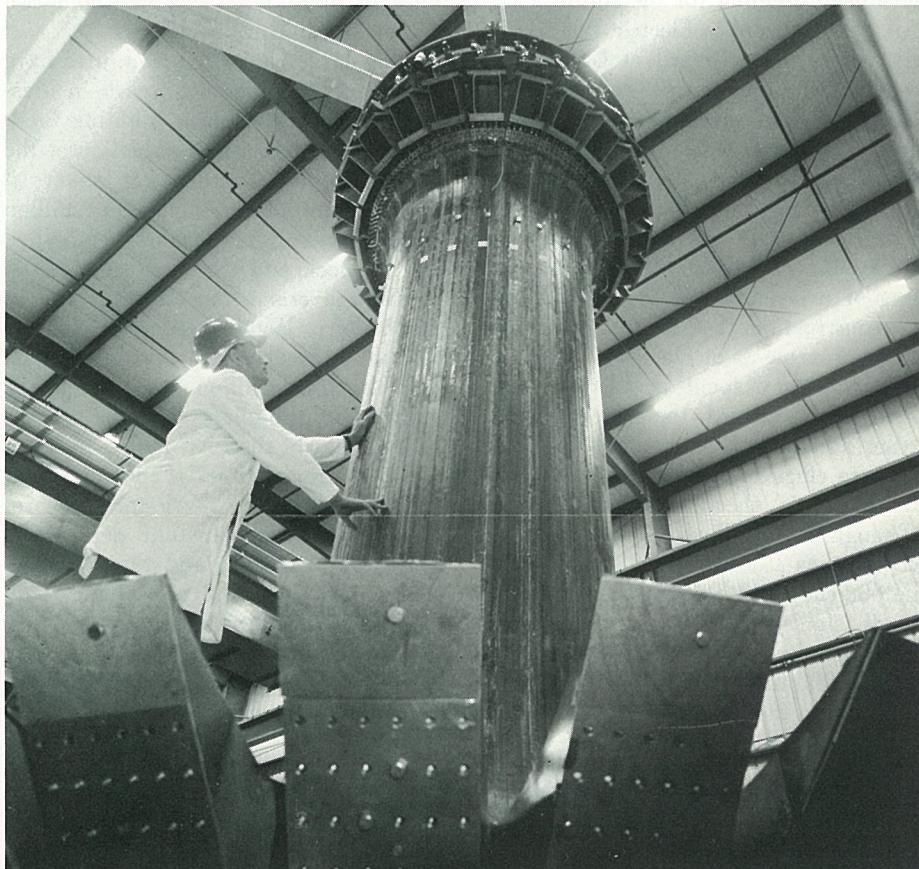
Published by General Dynamics Corporation, Pierre Laclede Center, St. Louis, Mo. 63105

G. Alexander Smith — Manager of internal communication

Fred Bettinger, Jack Isabel — Contributing editors, Convair Edition



Magnet Model. Program Manager Dave Hackley displays model of a giant superconducting magnet Convair division will build for the Energy Research and Development Administration (ERDA). The 39-ton magnet, wound with more than five miles of superconductor, will be tested and evaluated at ERDA's Oak Ridge National Laboratory.



Lot of Copper. General Atomic technician checks out Doublet III centerpost made with laminated copper coil segments machined by Convair division. The fusion machine will go into operation next year and will be fueled by a form of hydrogen from seawater.

Lindbergh Stamp Designed By Fort Worth's Cunningham

A new 13-cent stamp, commemorating the 50th anniversary of the trans-Atlantic solo flight of Charles A. Lindbergh, was designed by Fort Worth Senior Design Engineer Bob Cunningham.

The stamp will be issued May 20th at Eisenhower Park, Long Island, near the

site of Roosevelt Field from which Lindbergh took off. It will go on sale nationally on May 21st.

The stamp is Cunningham's second; in 1976, he designed a stamp depicting two pioneer aircraft to celebrate the 50th anniversary of commercial aviation in the United States.



Lindbergh Commemorative. Bob Cunningham's stamp depicting the New York to Paris flight of Charles A. Lindbergh is unveiled at the National Air and Space Museum of the Smithsonian Institution in Washington. Mr. Cunningham (left) and S. Dillon Ripley, Secretary of the Smithsonian, were on hand at the ceremony.

Capital Expenditures Are Building GD's Future

In the 10 years before 1974, General Dynamics spent an average of \$58 million a year for new and improved facilities and equipment.

Then, three years ago, capital expenditures increased sharply, each year almost doubling the average of the previous 10 years. In 1974, GD spent \$107.6 million on capital projects; in 1975, this increased to \$167.9 million, and, in 1976, \$146.4 million was spent in this area. And this year, according to GD Chairman and Chief Executive Officer David S. Lewis, capital expenditures "will continue at about the same level as last year."

The reason for this increase, E. Warren Fedderson, Corporate Director of Manufacturing and Facilities, says is that "General Dynamics has been developing and marketing many new products which are technologically advanced and require new manufacturing facilities. In other areas, growing sales of current products require additional production capacity and additional raw material resources."

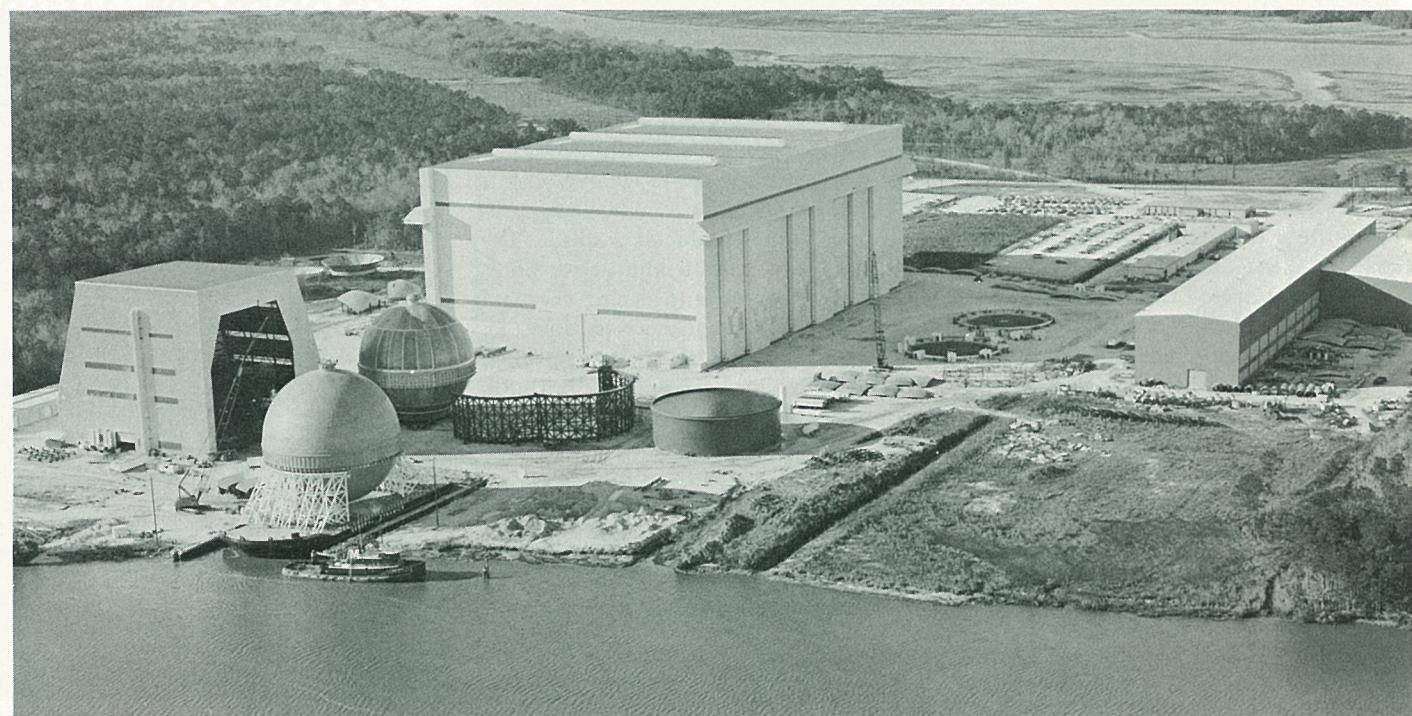
"In short," Mr. Fedderson says, "we have been building for the future."

A case in point is Electric Boat division, where the shipyard at Groton has been building submarines for 50 years. When GD won contracts for SSN 688-class fast-attack and Trident submarines, those 50-year-old facilities had to be modernized and expanded.

Thus far, GD has spent more than \$140 million for construction and equipping of a seven-acre land-level submarine construction facility at Groton and for improvements at Quonset Point.

"The money spent at Electric Boat has greatly altered the way we construct and launch submarines and will improve efficiency and reduce our costs in the years ahead," Fedderson says. "Though \$140 million is a lot of money, EB now has a backlog of \$2.6 billion on the 688-class and Trident programs and the division's total work force has grown from less than 16,000 in 1973 to more than 30,000 today."

The new facility gives EB the capa-



Sphere Builder. General Dynamics has invested \$80 million in this sphere construction facility at Charleston, S.C. The corporation's ability to produce the cryogenic

spheres for the liquefied natural gas tankers under construction at Quincy Shipbuilding division has placed it on the "leading edge" of the tanker industry.

bility to build three 688-class and two Trident submarines each year.

Other large capital expenditures have been made at Quincy shipyard in Massachusetts and its sphere building facility at Charleston, S.C. Production of the 936-foot liquefied natural gas tankers at Quincy required more than \$40 million for a new building basin, a modified graving dock and the huge new 1,200-ton Goliath crane, the largest crane in the Western Hemisphere, and another \$80 million has been spent at Charleston.

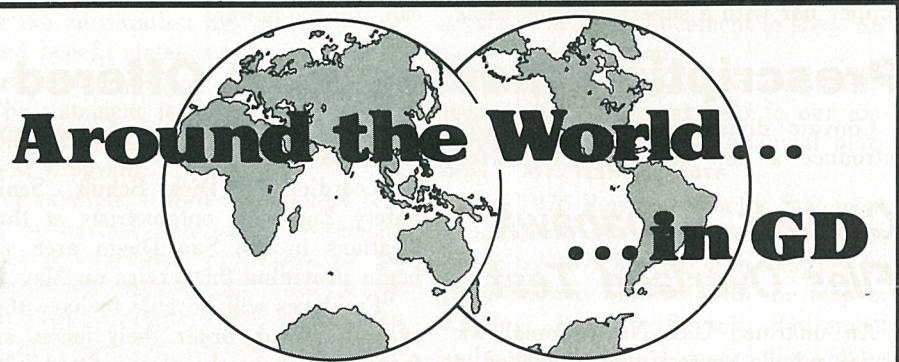
"This \$120 million has placed the Quincy Shipbuilding division at the leading edge of the LNG tanker industry at a very crucial time," Fedderson says. "Both Quincy and Charleston are producing on a regular and dependable production schedule, and that is essential for any successful program."

Capital expenditures are required for a company to replace obsolete equipment or to make productivity improvements and keep manufacturing capabil-

ity current with new products and materials, Fedderson says.

Significant capital expenditures are also being made to make certain our plants comply with Occupational Safety and Health Administration, Environmental Protection Agency and fire protection requirements.

In 1976, major capital improvements were made at Electric Boat, Quincy, Charleston, Freeman United, Asbestos, Marblehead, Stromberg-Carlson and Pomona. This year, new and improved facilities are planned at Convair, Asbestos, Fort Worth, Electric Boat, Marblehead, Data Systems and DatagraphiX.



At CHQ: Michael A. Dolan has been promoted to Manager of Financial Planning—Commercial . . . Robert L. Robbins has been promoted and transferred from Fort Worth to Langley, Va., as Langley Representative . . . John F. Langer, Frederic M. Koblenzer, Francis J. Beeby and Redford A. Perrine Jr., have joined as Corporate Pilots . . . Robert W. Oliphant was promoted and transferred from Fort Worth to Cambridge, Mass., as Cambridge Manager . . . Nancy E. Dagen was hired as Consolidation Accountant.

At Convair: Leland E. Bolt and Albert J. Von Der Wische were promoted to Senior Project Engineer . . . Anton K. Simson was promoted to Director—Planning . . . Jean A. Malthaner was promoted to Program Engineering Manager . . . Warren G. Hardy and R. E. Strayer were promoted to Program Engineering Chief . . . J. S. Miller was promoted to Program Group Engineer . . . Thomas R. Henry was promoted to Factory Manager . . . Stanley D. Hays and Robert W. Klaushie were hired as Design Specialists.

At Fort Worth: Charles A. Anderson was promoted to Engineering Director . . . John K. Buckner was promoted to Engineering Manager . . . Donald E. Jones transferred from Electronics and was promoted to Director, Estimating and Cost Analysis . . . Harold R. McCaslin was promoted to Director of Cost Proposal—Development . . . Bernard R. Nicely was promoted to Design Specialist . . . David J. Wheaton was promoted to Engineering Program Manager . . . Byron P. Cavnar Jr., was named Production Management Specialist . . . John P. Lamers was promoted to Marketing Manager . . . I. J. Smith was named Chief of Subcontract Management . . . Gordon L. Brownlee Jr., was named Manager of Logistics Operations . . . Gene E. Miller was named Manager of Logistics Supply.

At Stromberg-Carlson: David L. Hinshaw has been promoted to Director of DCO Engineering . . . Jaime Bravo has joined as Manager of International Products . . . Charles W. Kemp has joined as Manager of Software Development PBX . . . Dr. Alexander L. Strasser, Medical Director of Stromberg-Carlson and Corporate Consultant in occupational medicine, has been appointed to the Regional Council on Environmental Health for the Finger Lakes Health Service in New York . . . Pedro A. Lenk has been promoted to Principal Engineer.

At Pomona: Donald B. Wilson was promoted to Manager of Production Engineering . . . Jerry K. Lockard was promoted to Engineering Manager . . . Beverly A. Hughes has joined as Design Specialist . . . David E. Ongley was promoted to Development Project Engineer . . . Barry E. Franco was promoted to Development Project Engineer . . . Robert L. Smith joined as Engineering Staff Specialist . . . Joseph Suarez joined as an Engineering Specialist.

At Electronics: John C. Heising, Esther L. Malkoun and James E. Robbins joined as Senior Electronics Project Engineers . . . Melvin A. Peabody joined as Manager of Industrial and Manufacturing Engineering . . . Roy A. Zimmer joined as Program Manager.

At Eastern Data Systems: John Brychcy was promoted to Manager Data Systems Services—Quincy . . . Harry L. Turner II, was promoted to Manager Data Systems Services—Electric Boat.

At Material Service: Michael E. Winter has been appointed General Manager of Engineering Sales and Service . . . Herbert J. Greenspan has been appointed to the new position of General Manager of Customer Service and Marketing.

At DatagraphiX: Doug Fremming has been promoted to Dallas District Sales Manager.

Council to Televise Survival Test

The National Safety Council will present "The National Disaster Survival Test," an NBC Television Network "Big Event," at 8 p.m. Sunday, May 1. More than 200 NBC stations coast-to-coast will carry the program, which will dramatize how a person can survive a disaster—whether from a tornado, a fire, a flood, or an earthquake.

As part of the program, the NSC has prepared test forms so that individuals and families can watch the situations and test whether they know the best course of action for survival in a disaster.

All GD employees and their families are urged to take the test.

THE NATIONAL DISASTER SURVIVAL TEST

A Warren V. Bush Production in cooperation with the National Safety Council
NBC Television 8:00 p.m., Eastern Time, Sunday, May 1, 1977

OFFICIAL TEST FORM							
I. JUDGMENT				II. KNOWLEDGE			
1. a	b	c	d	1. T F	5. T F	8. T F	
2. a	b	c	d	2. T F	6. T F	9. T F	
3. a	b	c	d	3. T F	7. T F	10. T F	
Score _____				Score _____			
III. ALERTNESS							
1. Yes No				Score _____			
2. List the number of potential dangers: _____				Score _____			
IV. STRESS							
1. Yes No	9. Yes No	Score _____				V. LEADERSHIP	
2. Yes No	10. Yes No	1. a	b	c	d	Score _____	
3. Yes No	11. Yes No	2. a	b	c	d	Score _____	
4. Yes No	12. Yes No	Score _____				PRELIMINARY SCORE _____	
5. Yes No	13. Yes No	Score _____				VI. SPECIAL SCORING	
6. Yes No	14. Yes No	Score _____				YOUR FINAL SCORE _____	
7. Yes No	15. Yes No	Score _____					
8. Yes No		Score _____					

New York City Launched by Electric Boat

By G. Alexander Smith

The fourth 688-class fast attack nuclear submarine to slide down the ways at Electric Boat is the first U.S. Navy ship to be named after America's largest city.

The *New York City* (SSN 696) is a nuclear submarine designed to attack enemy submarines and shipping with a variety of torpedoes and missiles. She was launched before a cheering crowd of thousands of military, government and civic leaders and GD officials, employees and their families. EB has contracts to build 18 of these underwater vessels.

The June 18th launching ceremony began on the red, white and blue draped speakers' platform, as Gorden MacDonald, Executive Vice President of GD and General Manager of EB, welcomed the visitors, and David S. Lewis, GD's Chairman and Chief Executive Officer, introduced Abraham D. Beame, Mayor of New York City.

As the ceremony progressed, unseen

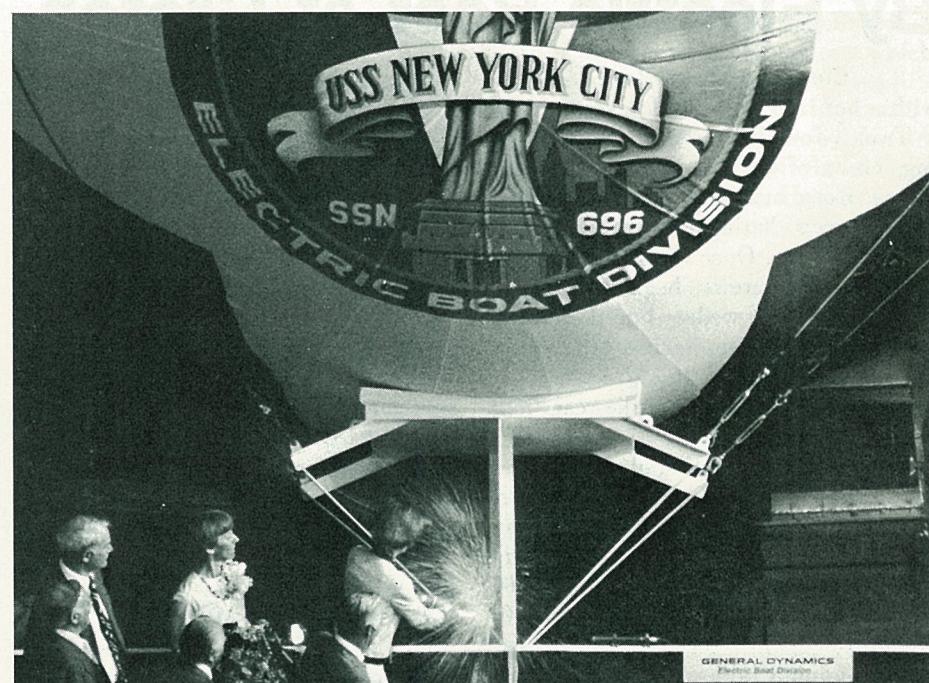
by the crowd, carpenters finished their prelaunch work down beside the submarine. At a signal, two carpenters knocked down the dog shores, and foremen began arming the launch trigger by unlocking a series of safety bolts.

Mayor Beame, referring to the financial problems of the city, said, "Though the *New York City* will go under, the city never will."

On the day before she was to be launched, the 360-foot-long *New York City* was resting on her building blocks while yard personnel erected a speakers' platform and hung bunting. Already positioned underneath the submarine were the launching ways, or greased rails, on which the ship would slide backwards into the Thames River. Ways are divided into two parts: ground ways which are stationary, and sliding ways which cradle the ship as it moves.

The surfaces between the two ways are coated with more than 7,000 pounds of a paraffin-like substance ironed smooth

Continued on Page 2



Splashy Launch. Mrs. James R. Schlesinger, wife of the Energy Adviser to the President, breaks the traditional bottle of champagne on the bow plate of *New York City*.

GD World

Vol. 7 No. 5

3

June-July 1977

"Everyone . . . Is Proud"

Thousands See LNG Aquarius Named at Quincy

(As GD World was going to press, LNG Aquarius had completed a series of dockside cargo handling trials at Canvey Island, near London, cleared the Suez Canal and set forth on a voyage to Indonesia.)

Shipyard workers and their families, and GD officials and guests — several thousand in all — witnessed the tradition-laden ceremony which marked the naming of the first of 12 liquefied natural gas tankers under contract at Quincy.

"I name this ship *LNG Aquarius*," Mrs. David S. Lewis, wife of GD's Chairman and sponsor of the ship, said. "May God bless this ship and all who sail in her." A champagne bottle was then smashed against the tanker's bow.

GD's Board of Directors and a delegation from Burmah Oil Co., Ltd. headed by Alastair Down, Burmah's Chairman, led the list of distinguished guests.

Amid the flurry of last-minute preparations before the May 28th ceremony, Ray Reese took a break from his job as chipper, looked around the deck and said, "I think everyone around here is proud to have worked on this ship."

"A few years ago, people were saying we couldn't raise the main beam on Goliath, but there it is," he said, pointing out the towering, sawhorse-like

crane rising above the Quincy shipyard a few hundred yards away.

"Then people were saying we couldn't build one of these ships, but here is the first one ready to go, and more are going up right beside her," he said.

Jack Durning, a burner, said, "I'll be glad to see this ship out of here — because when she leaves, it will prove we can build them and make them work."

A few days after the naming ceremony, the 936-foot tanker squeezed through the narrow Fore River Bridge, around a tight corner and headed for the open sea and the shipping lanes where she will transport natural gas between Indonesia and Japan.

The 936-foot-long tanker will carry 125,000 cubic meters of liquefied natural gas (LNG) cooled to 265 degrees below zero in five huge aluminum tanks.

The keel for *LNG Aquarius* was laid in December 1973, and the ship had been assembled in prefabricated sections.

A major problem occurred in the summer of 1974 when a subcontractor, after raising the A-frame legs of the huge Goliath crane, said it would be impossible to lift the 2,400-ton main beam to the top.

Undaunted, a team of 150 Quincy shipfitters, riggers, welders, electricians,

Continued on Page 4



Aquarius Named. A bottle of champagne, mounted on a mechanical arm, strikes the bow of the LNG Aquarius while P. Takis Veliotis (left), GD Vice President and General Manager of Quincy Shipbuilding division, Mrs. David S. Lewis (center), wife of GD's Chairman, and Mrs. Susan L. Lindholm, Mrs. Lewis' daughter, observe.

Buchanan Named Convair GM; Hawes to Head Pomona Division

Dr. Leonard F. Buchanan, one of the nation's leading authorities on tactical missile systems, has been named Vice President and General Manager of Convair division.

Ralph E. Hawes Jr., who has been serving as divisional Vice President — Research and Engineering at Pomona, succeeds Dr. Buchanan as Vice President and General Manager of Pomona division.

Grant L. Hansen, who has been the General Manager at Convair, will now serve as Vice President — Space Systems with full responsibility for the division's space programs.

Buchanan is a native of Arion, Ia., and was graduated from the University of California at Los Angeles in 1956 with a Bachelor of Science degree in engineering. He later earned both a Master of Science degree and a doctorate in engineering from the same institution. He joined General Dynamics at Pomona in 1956 and, after a series of increasingly important engineering



Buchanan



Hawes

and management positions, was named General Manager of Pomona in 1974.

Mr. Hawes is a native of Covington, La., and was graduated from Clarkson College of Technology, Potsdam, N.Y., with a Bachelor of Electrical Engineering degree in 1955. He later earned a master's in engineering from the University of California at Los Angeles in 1969. He joined Pomona in 1956 as an electronic engineer and has held a number of important technical and management positions.

GD Awarded Contract For Fifth Trident Sub

A \$354,500,000 contract has been awarded to Electric Boat by the U.S. Navy for construction of a fifth Trident ballistic missile-firing submarine, plus options for construction of two more.

This new award raises the value of the division's contracts for the 560-foot-long, 18,750-ton submarines to more than \$1.3 billion.

The highly advanced Tridents were designed and are being built at EB. The keel for the *Ohio*, the first of the class, was laid early last year at Groton, and

the keel for the second, the *Michigan*, was laid April 4th of this year.

Fabrication of subassemblies for the third and fourth ships is well along at the division's Quonset Point, R.I., facility.

Trident construction will offer job opportunities for the people of Connecticut and Rhode Island for the next several years as the program expands. Currently, EB employs nearly 30,000 people, primarily in those two states.

New York City Launched By Electric Boat at Groton

Continued from Page 1

with a hot iron plate, and yellow grease.

Twenty-four hours before the launching, crews of carpenters began pulling grease irons out from the sliding and ground ways, letting the two ways contact each other. Once the irons were removed, other crews began slamming five-foot-long oak wedges into the sliding ways to tighten them against the ground ways and the hull of the ship.

Early the next morning, the real "bull work" began.

After a final inspection of all the ways and safety shoring, 80 carpenters, 40 on each side of the vessel, began ramming the wedges further into the ways. Pairs of carpenters were assigned 12 to 14 wedges which they rammed with 90-pound weights in a series of 14 exhausting two-minute rallies.

"Nobody knows where the two minutes comes from," said Eugene W. LaJoie, Shipwright Superintendent. "But, believe me, when you are slugging at those wedges with those 90-pound rams, two minutes seems like an eternity. It's not the easiest work in the world."

As carpenters drove the wedges home, the ways began to pick up the weight of the submarine and the ship began to slowly move, or creep, toward the river. After the 14 ram rallies, the *New York City*'s creep amidships was a full sixteenth of an inch.

Raymond Magsumbol, a naval architect, explained that as they pick up more of the ship's weight, the wooden ways are flattened and move the ship.

"We monitor how much creep there is very carefully," he said. "If there is no creep, we have a problem. But if there is a progressively increasing creep, we know the ship is ready to go."

After the ram rallies were finished, 30 carpenters scrambled under the submarine and began knocking out the 120 keel blocks with 10-pound sledge hammers. When the keel blocks were removed, the creep at the stern of *New York City* measured more than an inch and a half.

With the keel blocks removed and the

timber shoring along the sides knocked down, the submarine was held from sliding only by dog shores jammed in between the ground and the sliding ways and the launch trigger assembly.

New York City was ready to go.

As the crew of carpenters took a break, the crowd of several thousand shipyard workers, their families and guests sporting red apples on their badges had taken their places for the launching ceremony at the bow of the *New York City* and along a pier outside.

The ceremony progressed with W. Graham Claytor Jr., Secretary of the Navy, introducing Daniel Patrick Moynihan, U. S. Senator from New York, who gave the address.

Following Sen. Moynihan's speech, Adm. H. G. Rickover, Director, Naval Nuclear Propulsion Program, introduced the *New York City*'s sponsor, Mrs. James R. Schlesinger, wife of the Energy Adviser to the President.

As Mrs. Schlesinger took her place at the bow holding a champagne bottle, Neal Bayard, a retired naval architect, stood ready to throw the launch trigger.

Over the yard's loudspeaker system Mr. Bayard could hear, "five, four, three, two, one . . . LAUNCH!"

Then Mrs. Schlesinger smashed the champagne bottle into the bow plate, and, on a final signal, a foreman pulled the last safety pin from the trigger. Bayard shoved the trigger arm forward, and the huge steel beams of the trigger dropped with loud thuds into the trigger pit.

New York City began to move, sliding backwards down the ways faster and faster until she slipped into the Thames River at about 20 miles an hour with the ship's horn blaring and the band breaking into "Anchors Aweigh."

"I'm glad I had a part in this," James Monroe, a carpenter, said later. "When the Trident submarines are launched, they will be put on a pontoon and then floated out into the river."

"That will be engineering power — the *New York City* was launched with carpenter power."

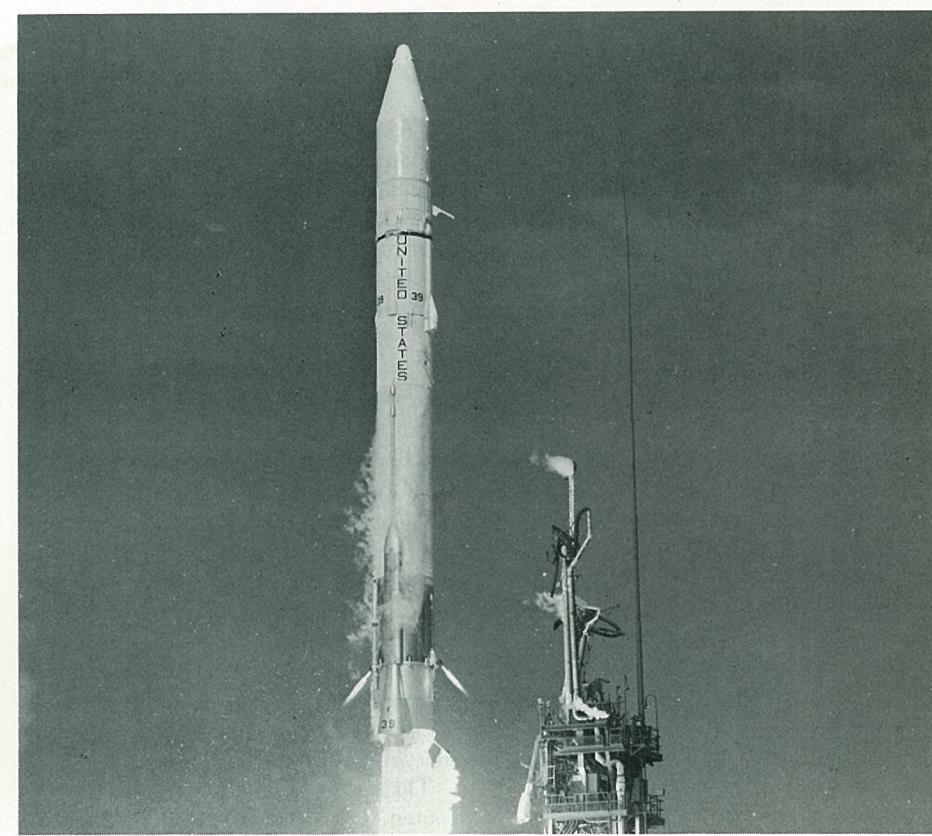


Photo Courtesy of NASA

Off to Orbit. The third in a series of Intelsat IV-A communication satellites is launched by an Atlas-Centaur rocket.

Atlas Boosters Lift Two Satellites

The first satellite in the NAVSTAR Global Positioning System (GPS) was successfully orbited in June by an Atlas launch vehicle fired from Vandenberg AFB, Calif.

Navigation Technology Satellite II rode aloft atop Atlas 65F and is the forerunner of a 24 satellite network that will make up the GPS.

The network of orbiting satellites is designed to provide highly accurate navigational positioning data to aircraft and surface vehicles. The NAVSTAR GPS will be used by all branches of the military and the Defense Mapping Agency.

The company's Electronics division is the system's integrator for the control and user equipment for GPS. The ground control segment is made up of four special satellite tracking stations in Alaska, Hawaii, Guam and Vandenberg AFB. Testing of the high-performance user equipment — small, lightweight, radio receivers — is already under way at the Yuma Proving Ground in Arizona.

In another launch, the third Intelsat IV-A commercial communications satellite was launched successfully aboard an

Atlas-Centaur space booster.

The powerful rocket and its payload, weighing 326,000 pounds at liftoff, blasted off from Complex 36A at the John F. Kennedy Space Center in Florida.

Following separation from the Atlas booster, the Centaur high-energy upper stage started its engines and injected the spacecraft into a parking orbit. Centaur and its encapsulated payload coasted for about 15 minutes before reigniting its engines to place the Intelsat into the proper transfer orbit. The Communications Satellite Corporation (COMSAT), which manages the Intelsat system for itself and 94 other owners, is checking the spacecraft systems out while it drifts towards station. It is expected to be operating by August.

The Intelsat IV-A joins two sister spacecraft over the Atlantic Ocean, where it will provide international communications services to countries from Central America to Iran. Three more satellites in the IV-A series are scheduled for launch later this year and in 1978 to complete the six-satellite group.

GD's Word World

Directions: In this game, General Dynamics-related words are defined below. The words fit on the spaces indicated.

1. An acronym for a company plan that brings personal financial security.
2. Name of a Freeman United coal mine in Southern Illinois.
3. The new Executive Vice President of the corporation.
4. Corporate Vice President-Science and Engineering.
5. The first in a line of LNG tankers to be built at Quincy Shipbuilding division.
6. AIM-7F.
7. A film card containing miniaturized rows of images of printed matter.
8. Hard inert materials sold by Material Service Corp. for mixing with cement and other materials to form concrete.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

Answers to last month's General Dynamics Word World:

1. Cryogenics 2. Force River 3. Quebec 4. Philadelphia 5. Sixteen 6. Thetford 7. Edwards 8. Goliath 9. Avenel 10. Phalanx 11. Tomahawk 12. Hustler 13. Quonset Point

MS Plans to Buy California Firm

Material Service Corp. has agreed in principle to buy the assets of Kaiser Industries Corp.'s Sand & Gravel division for approximately \$23 million. The division is headquartered in Pleasanton, Calif.

The sale depends upon the negotiation of a mutually satisfactory agreement,

the approval of the boards of directors of Material Service and GD, and approval of the liquidating trustees of Kaiser Industries.

Kaiser currently operates six aggregate processing plants, six ready-mix plants and three asphalt plants in northern California. Its sales in 1976 amounted to \$35 million.

First System Century® Cut Over

On July 16th, the first System Century® digital central telephone office was cut into service at the Coastal Utilities Inc. office in Richmond Hill, Ga.

It replaced a Stromberg Carlson XY switch that has served Richmond Hill residents since 1962, and the cutover marked the first local digital telephone exchange.

In June, the new central office, loaded

in a black and white tractor-trailer, rolled into Richmond Hill after the switch had been developed and built at S-C's plant at Sanford, Fla.

Full production of System Century is scheduled for later this year.

"The new system being installed at Richmond Hill will provide faster and more efficient service for subscribers," says Leonard A. Muller, President and Chief Executive Officer of Stromberg Carlson.

"It has a unique capability for growth to handle the anticipated increase in telephone use, and it will economically meet public demand for new features."

The system was cut into service by Glenn E. Bryant, President and Chairman of Coastal Utilities, which is an independent telephone company serving the Richmond Hill, Hinesville and Fort Stewart, Ga. area.

"The first cutover of such an advanced system here is a major event in the history of Coastal Utilities, the state of Georgia and the telephone industry," Mr. Bryant said.

Savings And Stock Values

The GD Savings and Stock Investment Plan unit values for the month of May were:

Salaried:

Government Bonds \$1.8971
Diversified Portfolio \$1.2081

Hourly:

Government Bonds \$1.8966
Diversified Portfolio \$1.2342
General Dynamics Stock \$52.75

Endless Meetings, Long Hours Led to — “3, 2, 1, 0...”

By Jack Isabel

“Go, baby, go!”

Those three words echoed almost in unison throughout the blockhouse 20 years ago when the first Atlas 4A missile lifted off on its pioneering flight. For most of those who had the enviable opportunity to be involved in that historic first in rocketry, it was a finale to a steady diet of long hours, endless meetings and a little luck, leading to the final countdown to “zero.”

For John Harrison, Test Conductor, it was applying countdown procedures learned while observing Redstone Missile operations in Huntsville, Ala. For Wally Withee, Manager of Atlas Test Bases, it was an extension of the static firing countdowns he had witnessed at Sycamore Canyon in San Diego and Edwards AFB, Calif. And for Tom Chitty, assigned to Complex 14, it was monitoring the Atlas missile in the hangar just after arrival from San Diego.

Mr. Chitty, now a base site manager at the Eastern Test Range, said that listening to the creaks and noises of the first Atlas at midnight while “tank watching” was eerie.

“Most of us had never been that close to a launch before,” he said. Chitty mentioned that one of the crew members took a model rocket to the launch site so he could be “the first to launch a rocket from Complex 14.”

According to Chitty, the launch team had been working around the clock for some time and was understandably keyed up.

“Although the flight was shorter than planned,” he said, “the feeling afterwards was one of achievement. We had launched an Atlas.”

Mr. Harrison, who today is a senior project engineer at Convair, says the six months preceding the launch were filled with activity.

“The missile itself represented only a part of the overall task in contributing to a program of national importance,”

Service Awards

35 Years

Operations: C. E. Roach Jr.

Quality Assurance: S. Teggart.

Research and Engineering: R. E. Strayer, C. C. Harness Jr.

30 Years

Operations: D. W. Grundstrom, S. Catalano, G. M. Barker, H. R. Short, H. Akiyama, M. Richardson, T. R. Christoff.

Industrial Relations: A. C. Gates.

Material: L. A. Rankin.

25 Years

Operations: T. Rockar, P. M. Kaufenberg, R. H. Steinberg Jr., C. J. Kapalla, D. R. Wilson, F. Aguero, G. D. Rankin.

Material: P. C. Tubach, R. J. Nickerson, R. W. Harris Jr.

Research and Engineering: F. T. Ferguson, R. C. Huyett, W. F. Brassell, R. A. Nau.

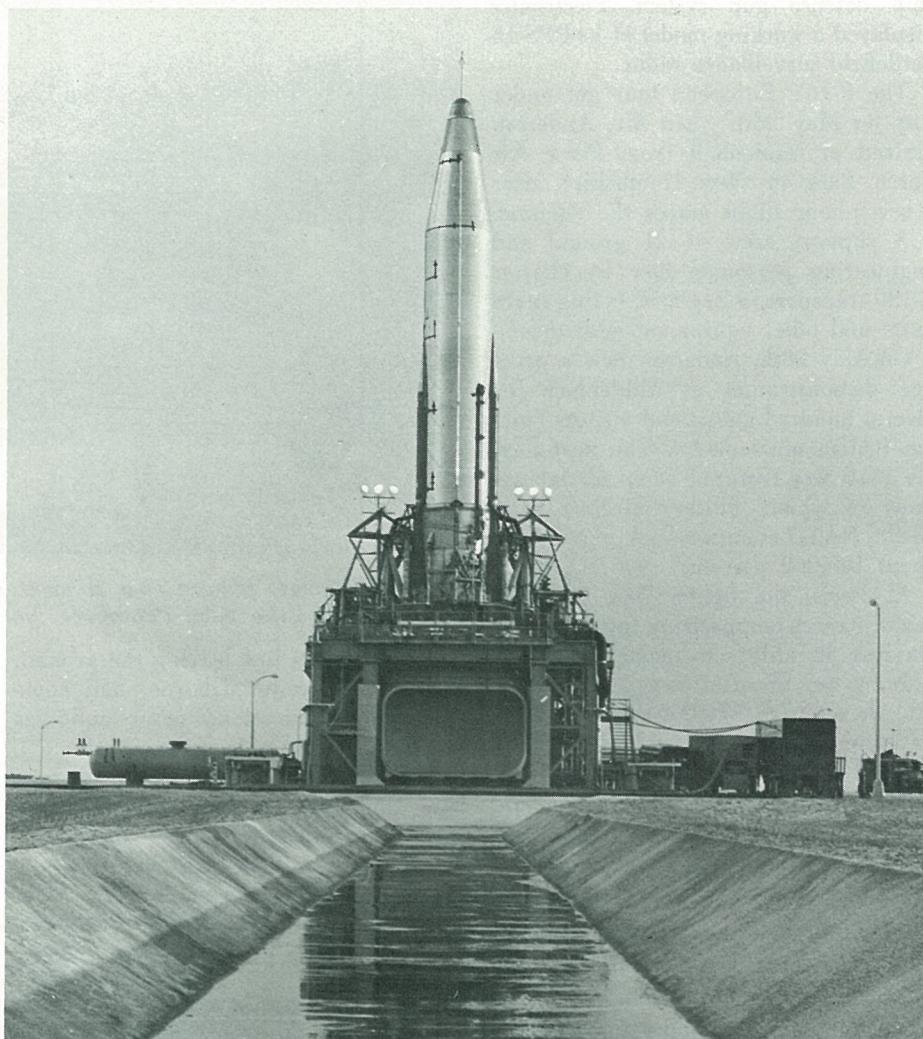
Contracts: J. E. Pate, F. J. Kennie, W. A. Wells.

Launch Vehicle Programs: R. W. Johnstone.

Finance: A. A. Valasakos.

Quality Assurance: J. A. Brown, J. M. Norman.

Data Systems Services: D. R. Hawkesworth.



Ready to Go. An Atlas 4A poised on its launch pad ready to blast into space. (Note huge flame bucket used to divert the intense heat and flame of the Atlas engines at liftoff.)

he said. “We were constructing a launch site, generating operating plans and developing countdown procedures.” He says that the countdown developed for the first Atlas is still pretty much the same used for today’s launches.

Harrison said Convair’s Charlie Bos-

sart, “Father of the Atlas,” watched the flight from a distant observation point.

“He told me later that he was certain that he was as tense as anyone at the launch control consoles during the countdown.”

“In looking back, the launch was not

only a first for the Atlas missile but a first for the many ground systems which had to perform flawlessly to achieve lift-off,” he said.

Although that first flight of Atlas 4A did not accomplish all of the defined objectives of the mission, Harrison says it did demonstrate the structural integrity of the missile.

“The missile experienced several seconds of violent maneuvering and tumbling, subjecting the airframe to structural loads much higher than design loads,” he said. The Atlas structure, which fell under considerable criticism because of thin-wall pressurized tanks, had proved to be of sound design.

Mr. Withee remembered the atmosphere in the blockhouse. “The tension continued to build up until one felt that something had to give. Although the crew had been through several counts preparing for this day, this was somehow different,” he said.

Withee, who is now Director of Energy Systems Marketing at Convair, strained his ears to catch every comment during the count as well as detect any possible trouble indicated by the tone of the system engineer’s voice.

According to Withee, the closed-circuit television monitors showed not only the entire missile but also the areas on the bird judged most critical—the engine section, the hold-down mechanism, the umbilical cord attachment and cryogenic vents.

“Although the blockhouse was cool,” Withee recalled, “I was wringing wet when 4A lifted majestically off the pad and rose slowly out of sight. When Johnny Harrison pushed the button, my own cheers were lost in the sudden cries of ‘Go, baby, go!’”

The rest is history.

Atlas Recorded Many ‘Firsts’

Since 1957, when Atlas 4A lifted off the launch pad, Atlas has continued to power some impressive “firsts” in space.

They include:

- First Communications Satellite (Project Score, December 1958).
- First U.S. Manned Orbital Flight (Mercury, February 1962).
- First Lunar Impact by an American Spacecraft (Ranger 4, April 1962).
- First Interplanetary Flyby (Mariner 2 to Venus, August 1962).
- First Televised Pictures of the Moon (Ranger 7, July 1964).
- First Close-up Pictures of Mars (Mariner 4, November 1964).
- First Lunar Soft Landing by an American Spacecraft (Surveyor 1, June 1966).
- First Mapping of Mars (Mariner, May 1971).
- First Jupiter Flyby and Jupiter Photos (Pioneer, March 1972).

Robertson Named VP of Marketing

James A. Robertson, 42, has been appointed Vice President—Marketing at Convair division.

Mr. Robertson was previously the Corporate Director of Government Relations—Eastern Division in GD’s Washington office. In that position he was responsible for marketing activities related to submarines, naval ships and missile systems.

He joined GD in 1961 as a research and development engineer at Electric Boat. For the past 10 years, he has held increasingly responsible management assignments, including posts as Manager of the company’s Cape Canaveral and Houston field offices and Director of Marine and Tactical Systems in Washington.

GD World

Published by General Dynamics Corporation, Pierre Laclede Center, St. Louis, Mo. 63105

G. Alexander Smith — Manager of internal communication

Fred Bettinger, Jack Isabel — Contributing editors, Convair Edition

Atlas Has Become Workhorse For Space Exploration Program

On June 11, 1957, an Air Force/industry launch team fired the Free World’s first intercontinental ballistic missile (ICBM) from the Air Force Missile Test Center in Florida.

The Convair-built Atlas 4A thundered off the Complex 14 launch pad at the Eastern Test Range on a pioneering flight that set the standard for America in establishing a potent ICBM force.

Six months later, in December, 1957, headlines and countless pages of newspaper and magazine copy told the story of the test firing of another Atlas from Cape Canaveral, and shortly after the Dec. 17th flight, the Department of Defense confirmed that an Atlas ICBM had been fired, and also confirmed the June launch.

From vantage positions several miles away, witnesses to America’s infant space leap reported that Atlas looked “like a huge icicle” because it had frosted over as the launch crew pumped bubbling liquid oxygen into its tanks.

One of the wire services reported, “There was a massive belch of white

smoke, then a blast of flame and the Atlas began to rise slowly . . . Its fiery exhaust burned a hole in the thick cloud band overhead . . . Its speed increased and in within one minute it was out of sight, leaving a trail of white smoke behind . . . The thunder of its engine could be heard . . . long after it disappeared.”

More than 400 Atlas missiles have been fired since those historic blastoffs in 1957.

Almost five years after the first firing, another Atlas on the same launch platform at Complex 14 sent John Glenn, the first American astronaut into orbit around the Earth.

Today, Atlas is no longer a powerful intercontinental ballistic missile. It has evolved into an effective and reliable workhorse booster used for the launch of Earth satellites and interplanetary missions.

A combination of Atlas and Centaur, a high-energy upper stage serves as the standard launch vehicle for the National Aeronautics and Space Administration for intermediate-weight payloads.

F-16 Dazzles Thousands on European Tour

Crowds totalling almost a million watched dazzling aerial performances by F-16 Prototype No. 2 in a five-week, four-nation European tour in June that included the needle-nosed fighter's second appearance at the Paris Air Show.

With GD Chief Test Pilot Neil Anderson at the controls, the multirole fighter flew 19 six-minute demonstrations of its maneuverability and acceleration.

In addition to the Paris Air Show, flights were flown at the U.S. Air Force Base at Mildenhall, England; at the Royal Netherlands Air Force Base at Leeuwarden and Gilze-Rijen, the Netherlands, and at the Belgian Air Force Base at Sint Truiden, Belgium.

General Dynamics was host to thousands of visitors at its chalet on the flight line at Le Bourget Airport near Paris during the biennial aviation extravaganza in France. A number of officials from the four North Atlantic Treaty Organization (NATO) partners that will coproduce the F-16 joined GD corporate and Fort Worth division personnel in showing visitors the company's new aircraft and its marketing potential.

The Pomona and Electronics divisions also sent marketing representatives, and the corporation's technological diversification was shown at one end of the chalet by a working replica of the F-16's fly-by-wire sidestick controller and at the other end by models of Pomona's Standard family of missiles, a Sparrow AIM-7F and a sample of the new Viper antitank weapon. Other displays included the 5-inch Anti-ship Missile Defense System and the Phalanx close-in

ship defense gun system. Electronics displayed a working model of its PPS-15 battlefield surveillance radar.

The F-16's European tour got under way on May 26th when Mr. Anderson arrived at Mildenhall from Pease Air Force Base in New Hampshire after a seven-hour flight across the Atlantic.

A support crew of 21 ground and engineering personnel flew by charter C-130 transport to England, taking spare parts and other equipment with them.

On May 28th, Anderson flew a practice demonstration at Mildenhall for several hundred guests and visitors from the British news media. The next day, the F-16 was featured at an all-day air show in which military aircraft from all the NATO countries took part before about 100,000 persons.

At Paris, the fighter flew 10 daily performances emphasizing, among other features, its ability to make tight turns without use of afterburner. Air Show officials reported 470,000 entrance tickets were sold — an increase of more than 12 percent over 1975.

After the Paris Air Show ended, the F-16 flew next to Leeuwarden Air Base in the north of Holland on June 16th, and because of a cloud ceiling of less than 1,000 feet, Anderson was forced to cut his demonstration to turns and rolls and other low level maneuvers, eliminating higher altitude climbs and loops.

At the request of the Royal Netherlands Air Force, Anderson made a high performance takeoff in formation with a RNLA F-104 Starfighter. While the



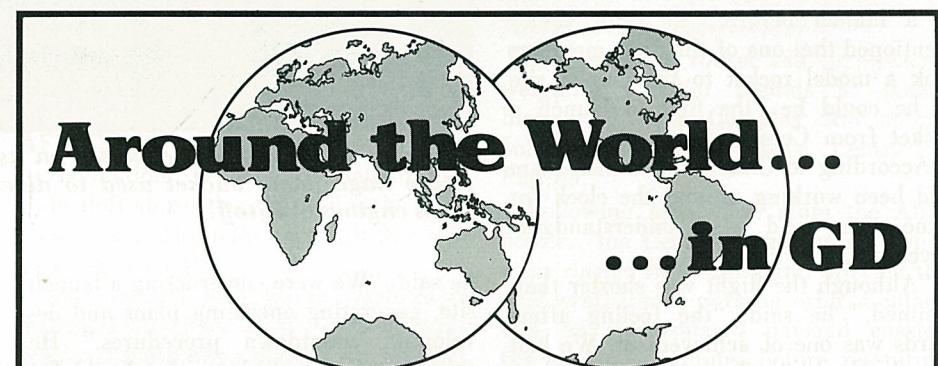
Crowd Pleaser. Where ever it went on its five-week, four-nation European tour in June, the F-16 Prototype No. 2 drew crowds.

Starfighter was just leaving the ground, the F-16, already airborne, had come back under the cloud cover and was starting its aerobatic demonstration.

The final stop on the European tour was Sint Truiden in Belgium where rain threatened to cancel the show. Despite intermittent rain and the low cloud ceiling, Anderson put on what

some spectators felt was his most impressive demonstration of the 34-day tour.

The F-16 Prototype then returned to the United States on June 29th to Langley Air Force Base in Virginia, and, on the 30th, Anderson put on a demonstration for personnel of the Tactical Air Command headquarters.



At CHQ: Larry W. Barker was hired as Industrial Relations Specialist DSS . . . Terrence McKenna was transferred from Stromberg-Carlson as Auditor . . . Richard W. Corbin was promoted to Manager, Financial Planning-Ordnance and Electronics . . . Michael G. Harris was promoted to Supervising Senior Auditor . . . Mary Jo Finkes was promoted to Graphics Designer/Illustrator . . . David M. Mattingly has joined as Supervisor of General Accounting . . . Freda Monk has been promoted to Planning Representative . . . Jeffrey B. Ferrey has joined as Senior Electronic Data Processing Auditor . . . Dr. Garry C. Henderson has transferred from Fort Worth and has been named Director-Research and Advanced Development . . . Richard W. Durbin transferred from Orlando and was promoted to Manager, Data Systems Services-St. Louis, CDSC . . . Gene F. Rhodes was promoted to Government Accounting Administrator.

At Electric Boat: Carl O. Larson Jr. has been promoted to Manager of Nuclear Engineering Analysis . . . Victor B. Burdick was promoted to Manager, North Yard . . . William M. Cannon was promoted to General Superintendent . . . Robert A. DiNapoli was promoted to Manager, Nuclear Operations . . . Norman H. Kelly was promoted to Superintendent . . . James C. Meehan was promoted to Manager, Nuclear Repair Facility . . . Richard C. Palmer was named Manager of Reactor Services . . . Michael W. Toner was named Manager, Ship Management . . . Gordon S. Hunter was named Engineering Specialist . . . Samuel G. Morrison and Thomas F. McCarthy were named Principal Engineer . . . George F. Monahan was named Medical Director at Quonset Point.

At Quincy: E. G. Nicholson joined as Manager of Facilities and Maintenance at Charleston Facility . . . Walter G. Potts was promoted to Manager of Facilities and Maintenance at Quincy . . . Richard J. Masi was promoted and transferred to Quincy from St. Louis as Assistant Controller.

At Fort Worth: Ray C. Bissell Jr. has been named Engineering Manager . . . W. C. Donnelly has transferred from Convair as Senior Project Logistics Engineer . . . Calvin Porcher was promoted to Engineering Manager.

At Convair: Harold Lee was promoted to Superintendent . . . James B. Reed Jr. was hired as Engineering Chief . . . David S. Hackley was promoted to Program Manager . . . D. E. Herbert transferred from Electronics as Design Specialist . . . Edmund J. Smith joined as Design Specialist.

At DataphysiX: William B. Porter was promoted to Director of Marketing, responsible for domestic marketing functions . . . Donald D. Meyers was promoted and transferred from St. Louis as Manager of Finance.

At Pomona: George R. Estey was promoted to Senior Project Engineer . . . Charles R. Hildebrandt was promoted to Assistant Program Director-Phalanx Development . . . Walter J. Mastin was promoted to Program Director-Phalanx . . . Garland P. Thacker was named Assistant Program Director-Production . . . Michael C. Lucero was promoted to Section Head . . . William P. Wylie was named Director-Engineering Administration.

At Stromberg-Carlson: LeRoy E. Geary was promoted to Account Manager.

At Material Service: Thomas P. Haigh was hired as Tax Manager.

At Freeman United: Richard R. Clark joined as General Superintendent, Underground Mines . . . Ramesh Malhotra joined as Director of Market Planning.

At Asbestos: Michael Dell'Aniello joined as Director of Taxation.

F-16 Flies Across Country Nonstop and Unrefueled

In a dramatic demonstration of its long-range deployment capability, F-16 No. 2 took off from Edwards AFB, Calif., and flew nonstop and unrefueled to Andrews AFB, Md., earlier this year.

Carrying two 370-gallon external fuel tanks, the F-16 made the nearly 2,000 nautical mile flight in four hours and four minutes.

LNG Aquarius Named at Quincy

Continued from Page 1

engineers and pipefitters was assembled to do the "impossible" themselves.

Sixteen cables, suspended from the top of the crane's legs, were run through hydraulic lifting jacks and, over a three-day period, the beam was raised to the top, almost 300 feet in the air, six feet at a time.

"I have never felt anything like I felt leaving the yard that last day and seeing that big beam all the way at the top," said a shipfitter who participated in the lift.

"That was a moment I'll never forget."

Meanwhile GD bought a site at Charleston, S.C., from a subcontractor building containment spheres for the LNG tankers and constructed its own fabrication facility. The spheres are now being produced at a rate of 2½ per month.

After each of the 120-foot-diameter, 850-ton spheres is completed and is covered with eight inches of insulation, it is barged 900 miles up the Atlantic Coast to Quincy. There, it is picked up by Goliath and placed in the tanker hull.

GD has invested \$120 million in Quincy and Charleston for the LNG tanker program, and construction of the high technology tankers will provide jobs for thousands of employees for years.

LNG Aquarius is the first LNG tanker to be built in this country from the keel up.

Safe Design

L. Emmett Holt, Director of Engineering for Quincy, says safety has been a prime consideration in the design of the

multirole fighter was flown to Andrews for the Armed Forces Day Open House which was held on May 21st, the first time the F-16 has been shown to the public in the Washington, D.C., area.

In May 1975, F-16 Prototype No. 2 had flown nonstop from California to Florida, but it had been refueled once in flight.

The ship is double-hulled, three-quarter-inch steel plate, and each sphere, suspended by a ring around its middle, sits in a separate air-tight hold. The space around the spheres is filled with nitrogen and constantly monitored by sensors to determine the presence of leaks.

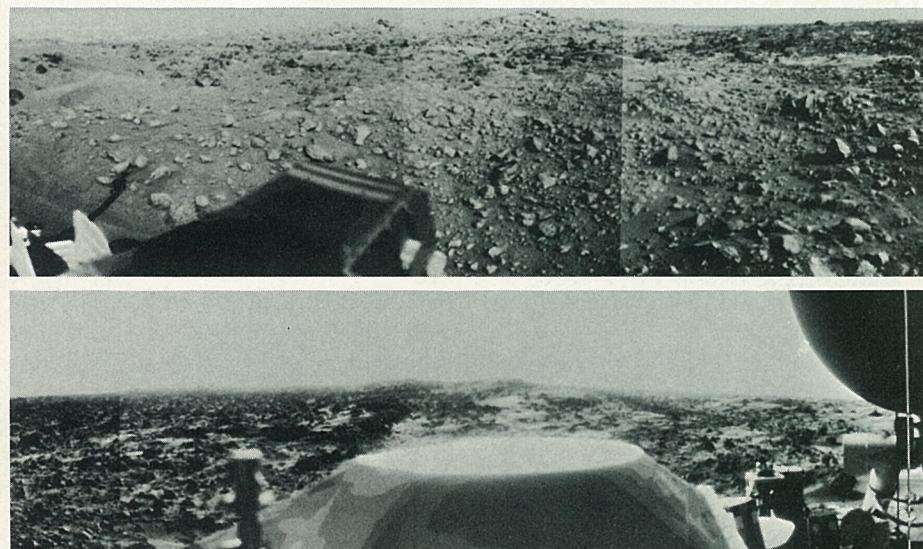
Even though the spherical tanks are heavily insulated, some natural gas boils off. This is not wasted, but piped to the ship's boilers to provide propulsion during the ocean voyage.

Mr. Holt says the navigational equipment installed in the LNG tankers "is unmatched by any modern merchant vessel."

Each Quincy tanker carries two radar sets, three depth finders, collision avoidance equipment and gear to take position plots from satellites.

"For its size," he continues, "this ship is highly maneuverable." He says *LNG Aquarius* stopped dead in the water from full speed of 20.7 knots, in eight-and-a-half ship lengths and turned in a radius of less than half a mile during her sea trials.

"The sea trials were an almost perfect success," he says, "we had only one malfunction — the copying machine broke down reproducing the record of the trials."



Photos Courtesy of NASA

Martian Panorama. These photos are the first panoramic views of the Planet Mars transmitted to Earth by Viking I. In the top photo, the Martian surface contrasts the brightness of the planet's late afternoon sky. The horizon features are approximately 1.8 miles away. In the bottom photo, the projections on and near the horizon may represent the rims of distant impact craters.

GD Boost Sent Viking On Historic Mars Trip

The first of two Viking spacecraft made a landing on Mars on July 20 after an 11-month-long chase through space to overtake the red planet.

The chase began last August when Viking 1 was launched atop a Titan-Centaur rocket. Viking 2 followed a few weeks later.

The effort was the most ambitious unmanned project of the space program so far.

Viking 1 was originally scheduled to touch down on July 4, the 200th anniversary of the United States. However, scientists found the prime landing area — the Chryse "Land of Gold" region — too hazardous for a safe landing and delayed the landing until July 20.

General Dynamics' Atlas launch vehicles and Centaur space boosters, both produced by Convair, have played a major role in Martian investigations. The Atlas-Centaur combination boosted Mariner spacecraft for flyby missions to Mars in 1965 and 1969.

In 1971, Atlas-Centaur sent Mariner 9 on its way to take 9,000 detailed pictures of the planet's surface. According to the National Aeronautics and Space Administration, that successful mission showed Mars is a fit subject for scientific study and provided the information needed to construct maps from which the Viking landing sites were selected.

The Viking spacecraft are packed with instruments and are made up of an Orbiter and a Lander. Each Orbiter carries three experimental devices and each Lander contains eight more.

Moments after touchdown, the Viking Lander took surface photographs which were telemetered to Earth through the Orbiter. Several other instruments began operation in the following days to study the planet's biology, molecular structure, inorganic chemistry and physical and magnetic properties.

Viking 2 will begin orbiting Mars on Aug. 7, and, according to NASA, its Lander is scheduled to touch down about Sept. 4.



Ceremonies Mark Coproduction Contracts for European F-16s

The first contracts for coproduction of the company's F-16 Air Combat Fighter in Europe have been signed in separate ceremonies in each of the four countries which have ordered the high-performance, multimission aircraft.

The contract signings kept D. Blaine Scheideman, Fort Worth Vice President and F-16 Deputy Program Director-International, on a rapid country-hopping schedule as he attended ceremonies in the Netherlands, Belgium and Denmark on successive days.

The ceremonies began on Tuesday, July 13, when Mr. Scheideman, J. R.

Thayer, Manager of GD's International Resident Office in the Netherlands, and representatives of the Dutch aircraft firm, Fokker-VFW B.V., signed a \$190 million contract in The Hague. Under the agreement, Fokker will produce major fuselage and wing components for more than 500 of the new fighters and will complete final assembly and delivery of up to 102 complete aircraft to the Royal Netherlands Air Force and an additional 72 aircraft to the Royal Norwegian Air Force. Fokker-built components will also be delivered to final assembly lines at Fort Worth and in Belgium.

Returning to Brussels, Belgium, Scheideman and Andre Richir, GD's F-16 Program Representative-Belgium, met with officials of Fairey, S.A. of Belgium to sign a \$97.8 million contract for coproduction of the new fighter there.

Fairey, together with SABCA, another Belgian aircraft manufacturer, will assemble up to 116 F-16s for the Belgian Air Force and up to 58 others for the

(Continued on Page 2)

Atlas-Centaur Lifts Second Comstar

A GD Atlas-Centaur boosted the second Comstar satellite into orbit July 22 from Cape Canaveral, Fla. The satellite is the second of three switching stations in space which will be positioned 22,240 miles above the Equator to handle telephone conversations for all the 50 states and Puerto Rico.

(See Picture Story Page 4)

Stromberg Introduces New 'System Century' Digital Switch Family

By Robert B. Ford

A new family of computer-operated digital switching equipment for the telephone industry's second century, has been introduced by Stromberg-Carlson.

System Century™, designed at the company's Sanford, Fla., and Rochester, N.Y., plants, is economical enough for small telephone offices and sophisticated enough to provide a full range of special features that are compatible with existing and future technologies.

"For years, the telephone industry has been looking forward to the price and feature advantages possible with digital switching," says Leonard A. Muller, President and Chief Executive Officer of S.C. "Now it's here and it's affordable, not only by large telephone companies, but by even the smallest independents that serve most of the nation's smallest communities."

"Our primary goal in designing System Century products was to create a family of digital systems that would have the same price and reliability impact on the telephone industry that the Stromberg-Carlson XY® switch had 30 years ago. I believe we have exceeded that goal," Mr. Muller says.

The new family of switching systems includes:

- Digital Central Offices (DCO), the first software common-controlled switches that are economical enough for small offices of less than 200 lines and yet permit expansion to more than 20,000 lines. Initial configurations of DCO will be available for shipment in 1977 at a price comparable to, or below, existing electromechanical and electronic switching systems.
- Digital Branch Exchanges (DBX), to be ready in 1978 with a mix of 240, 480 and 960 lines and trunks with special features required by any Private Branch Exchange (PBX) environment, including the business, hospital and hotel/motel markets.
- Digital Tandem (DTM) Systems for digital networks. The systems, called DTM 1000 and DTM 4000, will be in commercial service in 1980.

In addition to reduced initial cost, System Century products offer low maintenance costs and high reliability,

Muller says. For example, a significant industry standard for reliability is one lost call per 100; with System Century, the chance for lost calls is reduced to one in 10,000.

For the first century of telephony, phone calls were switched over a pair of wires one at a time. Now, with digital switching, up to 128 persons or machines can communicate simultaneously over a single pair of wires.

Savings have been achieved by time-divided digital multiplexing networks using Pulse Code Modulation (PCM) and by the application of existing computer hardware and software technologies.

The words are sliced by a System Century digital switch into eight million bits of information each second and are interwoven for transmission at nearly the speed of light. At the receiving end, the computer-controlled system then unscrambles each message in the proper sequence for delivery to the called phone.

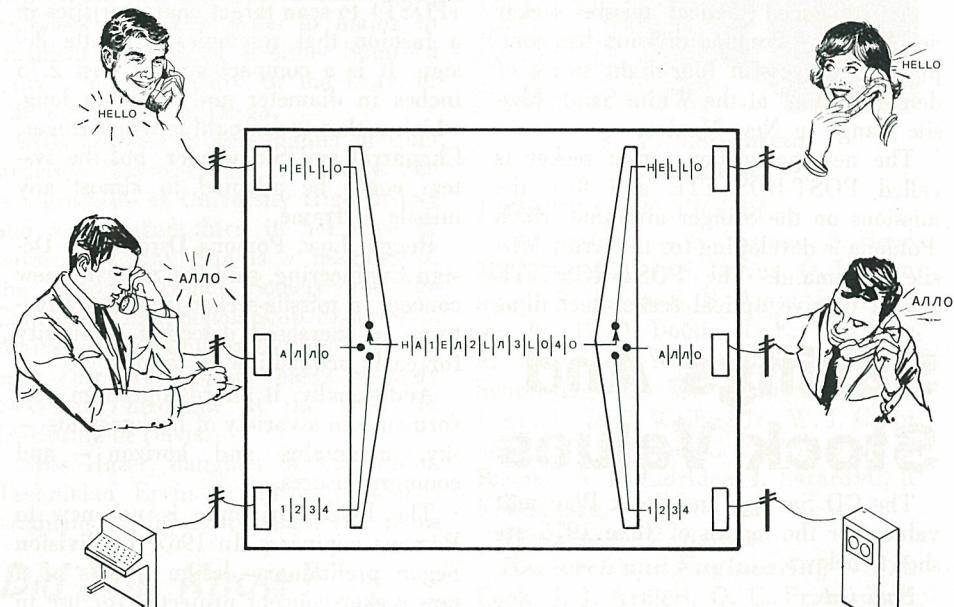
"At the heart of each system is a Stromberg-designed telephony preprocessor used for those repetitive functions unique to telephony which, when compared with commercially available mini-computers and microprocessors, give even the smallest central office all the switching features previously available only to very large installations," according to Muller.

System Century's telephony preprocessor is used for those repetitive functions unique to telephony, which frees the general purpose computers for call processing.

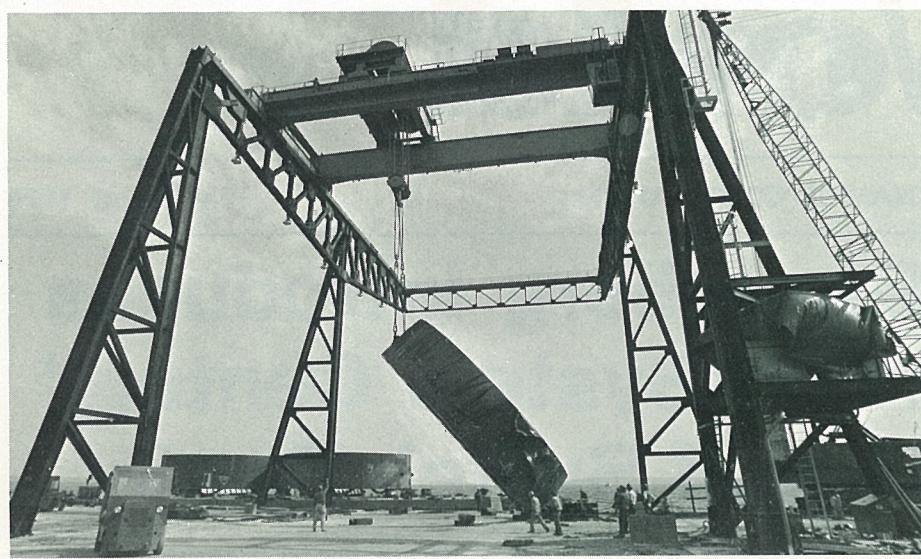
The new telephony preprocessor operates in nanoseconds, or billionths of a second, an advance of more than 100 times over the company's fastest existing processor and fast enough to take full advantage of the new System Century digital switch.

Development of the new product family was a total team effort. A program management group led by David B. Miles, Vice President of Planning and Product Management, was established to cut across departmental lines, improve internal communications and achieve cost effective standards.

Actual system design was accomplished (Continued on Page 2)



System Century. For 100 years, telephone calls have been switched over a pair of wires one at a time. Today, 128 people or machines can talk to each other in English, Russian, "computer" or any other language over a single pair of wires. The words are sliced into eight million bits of information each second. Stromberg's computer-controlled digital system then unscrambles them in the proper sequence for delivery to the called telephone or computer.



Trident Progress. Construction of the nation's first Trident missile submarine, the Ohio, moves ahead as a crane loads giant hull sections on board a barge at General Dynamics' Quonset Point, R.I., facility for shipment to the firm's Electric Boat division at Groton, Conn.

GD Tomahawk Sets New Flight Records

A fully guided Tomahawk Cruise Missile set new records for flight duration and range during a successful flight at White Sands Missile Range in New Mexico on July 16.

Following the launch from under the wing of a Navy A-6 aircraft, the Convair missile flew for one hour and 24 minutes and navigated itself on a race-track pattern over the test range for more than 574 miles.

The flight marked the second successful test of a Tomahawk equipped with Terrain Contour Matching (TERCOM) navigation system. TERCOM compares measured terrain heights with heights stored in an on-board computer and corrects the missile's course and altitude based on the navigational fixes obtained.

The primary objective of the test flight, which marked the first use of TERCOM's terrain guidance capability, was to obtain information on the new navigation system. The missile's TERCOM set was also used to navigate the A-6 launch aircraft from a takeoff at Point Mugu, Calif., to the predetermined launch point over the White Sands Missile Range.

The flight was successfully completed over all geographic check points. The Tomahawk then guided itself to a pre-designated landing zone and activated its parachute descent system. It was recovered after a soft landing. After post-flight analysis, and refurbishment, the missile will be flown in follow-on test flights.

Buzzing Bees Besiege Busy EB Builders

Electric Boat shipyard personnel recently overcame a problem that had stinging possibilities — 10,000 honey bees that swarmed into a welding control grid station.

The four-by-five-foot unit supplies power to a number of welders, none of whom understandably wanted to go near it with the bees in residence.

An SOS went out to Charles Cady of the technical publications department who is a part-time beekeeper. He arrived at the scene dressed in a bee veil and thick leather gloves.

Within minutes, Mr. Cady had gingerly scooped most of the swarming mass into a cardboard box, had smoked out the rest and was on his way to his apiary, The Honey House, in nearby Old Mystic, Conn.

Queen, workers and drones at last report were doing fine in one of Cady's many hives — and the welding continues.

Cady speculated later that the bees had used the welding grid control station for a rest stop after flying across the nearby Thames River.

Missile Seeker Completes Army Test Flight Program

An advanced tactical missile seeker developed by Pomona division has completed a successful four-flight series of demonstrations at the White Sands Missile Range in New Mexico.

The new generation target seeker is called POST-ROSETTE and flew the missions on the Stinger airframe which Pomona is developing for the Army Missile Command. The POST-ROSETTE uses a passive optical seeker technique

(POST) to scan target characteristics in a fashion that resembles a rosette design. It is a compact system, just 2.75 inches in diameter and 5 inches long, which makes it compatible with Stinger, Chaparral and Sidewinder, but the system could be adapted to almost any missile airframe.

Reggie Low, Pomona Director of Design Engineering, said the radically new concept in missile-seeker technology features an increased detection sensitivity for early acquisition of targets.

Additionally, it affords optimum performance in a variety of backgrounds — sky, mountains and horizon — and countermeasures.

The POST principle is not new to Pomona engineers. In 1967 the division began preliminary design studies of a new seeker concept projected for use in missile weapon systems of the future. Pomona's design was selected in 1969 by the Army Missile Command for further development. The POST-ROSETTE is a direct result of those development efforts.

Savings And Stock Values

The GD Savings and Stock Plan unit values for the month of June 1976 are shown below:

Salaried:	
Government Bonds	\$1.7939
Diversified Portfolio	\$1.331
Hourly:	
Government Bonds	\$1.7928
Diversified Portfolio	\$1.3648
General Dynamics Stock	\$63.375

System Century Unveiled...

(Continued from Page 1)

at the Sanford and Rochester plants by teams headed by Barrie Brightman, Engineering Manager for the DCO line, and Klaus Gueldenpfennig, Engineering Manager for the DBX line. These teams were directed by George J. Smith, Vice President of Research and Engineering.

In addition, a General Dynamics Red Team, led by Dr. John Redmond, Director of Research and Advanced Development for GD, utilized experts from the Electronics, Fort Worth, Convair and Stromberg DatagraphiX divisions as well as from corporate headquarters to evaluate progress and performance every three months.

"The assistance provided by the Red Team was invaluable in expediting product development and in keeping us on the right technological track," Muller said.

System Century products will be manufactured at company facilities in Rochester, N.Y., Sanford, Fla., Camden, Ark., and Ardmore, Okla. Production lines will utilize automated techniques such as automatic component insertion and printed wiring board back planes. Both hardware and software will undergo complete system and load testing at the factory, keeping installation time and cost to a minimum.

Compactness through microcircuitry has reduced the space needed for equipment to a fraction of the area required by even the latest electronic systems. For example, a system with 6,000 lines and trunks can be housed in just 30 cabinets. A space-divided electromechanical switching system of the same capacity would require 110 cabinets and more recent electronic equipment of that capacity would require 80 cabinets.

F-16 Coproduction Contracts Signed in European Countries

(Continued from Page 1)

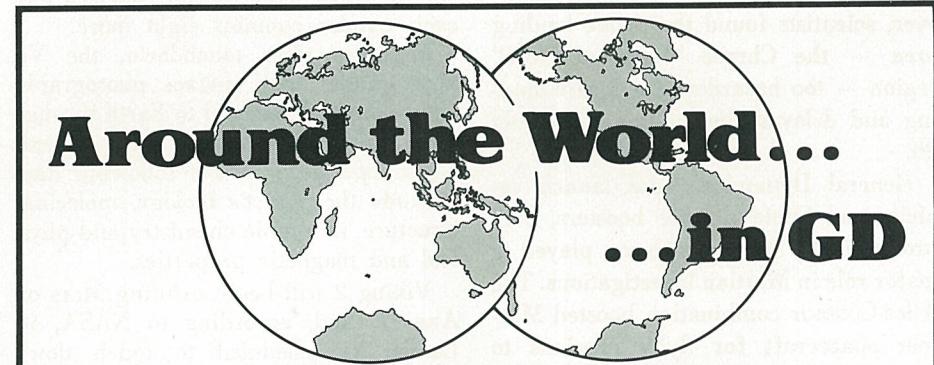
Royal Danish Air Force. Fairey will also produce components for use in aircraft assembled in the U.S. and in the Netherlands.

Flying to Copenhagen on Thursday, Scheideman and Michael Moldavsky, Manager of the International Resident Office in Denmark, met with officials of two Danish firms which will produce parts for the multinational fighter.

Under a \$13.5 million contract, Per Udsen Co. of Grenaa, Denmark, will produce vertical fin box assemblies and fuel and weapons pylons for the F-16. Standard Electric of Horsens, Denmark, will produce flight control system components under a contract which is expected to ultimately reach a value of about \$16 million for labor and materials.

On the Monday prior to Scheideman's country-hopping contract-signing schedule, Pratt & Whitney Aircraft Group of United Technologies Corp., prime contractor for the F-16's turbofan engine, kicked off the series of contract signings at ceremonies held at Kongsberg Vapenfabrikk A. S. in Norway. Kongsberg will produce engine fan drive turbine modules under a \$163 million contract from P&W.

The five contracts are the first negotiated under terms of the F-16 coproduction agreement made last year between the U.S. government and the governments of Belgium, Denmark, the Netherlands and Norway, which selected the F-16 for their air forces. Under that agreement industry in the four countries will play an important role in F-16 production.



At CHQ: Betty Scherrer was promoted to Corporate Office Personnel Manager. She will be responsible for all personnel activities involving salaried and salaried-support employees of the Corporate, Washington and field office locations of General Dynamics . . . Nancy Beyer joined as Employee Communications Administrator . . . Edward Bruntrager joined as Tax Administrator . . . Teresa McLafferty was promoted to Material Representative.

At Convair: Charles Bierman Jr. was promoted to Chief Project Engineer . . . Willard Buxton was promoted to Chief - Major Structures Procurement and Material Price Control.

At DatagraphiX: Charles Rowlands joined as Eastern Regional Marketing Operations Manager.

At DSS: Donald Richmond rejoined as Data Systems Specialist.

At Electric Boat: Aldo Raimondi has assumed duties as Chief of Trident Arrangements . . . Earl Flynn has been appointed Design Supervisor in charge of Trident Arrangements . . . Donald Way has been appointed Non-Nuclear Mockup Arrangement Supervisor.

At Electronics: James Gates joined as Program Manager - GPS Program Subcontracts . . . Robert Tobaison joined as Laboratory Manager.

At Fort Worth: Dan Daggett was promoted to Project Engineer . . . William Rose was promoted to Manager of Logistic Support.

At Freeman United: Larry Hudson joined as Supervisor - Heavy Equipment.

At Pomona: Freeman Stephens became Program Director - ASMD . . . Raymond Gill was promoted to Senior Project Engineer . . . Charles Cheesbrough, Arnold Shapiro and Marvin Sherfey were all promoted to Project Engineer . . . Wayne Hall was promoted to Engineering Specialist . . . Reginald Low was promoted to Director of Design Engineering . . . Dennis Freeman was promoted to Plant Manager - Camden and transferred to Camden, Ark. . . Daniel Luchsinger joined as Manager - News and Information.

At S-C: John Finnerty was promoted to Plant Manager - Charlottesville . . . Robin Stone joined as Assistant Counsel.



MOVE Graduates. The first group of trainees in the San Diego Urban League's Machine Operators Vocational Education (MOVE) program recently completed 16 weeks of instruction at Plant 19. In top photo, Wayne Turner, Convair educational services (left), and Bernard Ashcraft (right), Urban League associate director, look over kitchen tool machined by Azell Wilson. In photo below, Bob Moxley, Convair instructor on loan to MOVE program, displays machined memento presented to him by the class as token of their appreciation. Left to right are: Junior Vasquez, Henry Garcia, Mr. Moxley, Neil Strassman and Van Solmes. The MOVE program, supported by Convair division as part of its Affirmative Action Plan, was established to teach minority men and women the basic skills of machine shop operations.



G. L. Hansen Selected To Head NAB Effort

Grant L. Hansen, Corporate Vice President and Convair General Manager, has been named by President Ford to serve as Chairman of the National Alliance of Businessmen (NAB) for San Diego and Imperial counties. The appointment to the one-year term was effective July 1.

Mr. Hansen will direct NAB efforts in the two counties to find employment opportunities for the disadvantaged, disabled veterans and Vietnam veterans, plus summer jobs for school youths. He succeeds Fred W. Garry, President of Rohr Industries, Inc.

Convair Management Specialist Dennis D. Nelson III was appointed by Hansen to serve one year as the San Diego Metro Area Director for NAB, responsible for job procurement in the San Diego metropolitan area.

Earl Hatchett Elected To Head Association

E. Earl Hatchett, Vice President-Finance of Fort Worth division, has been elected president of the Lone Star Chapter of the American Defense Preparedness Assn.

ADPA is a nonprofit society whose members are committed to a strong defense posture.

Mr. Hatchett is a native of Amarillo, Tex., and was graduated from Texas A&M with a degree in management engineering. He is also a graduate of the Executive Program at Stanford Univ. Graduate School of Business Administration.

GD World

Published by General Dynamics Corporation, Pierre Laclede Center, St. Louis, Mo. 63105

G. Alexander Smith — Manager of internal communication

Patricia Lewis — Associate editor

Fred Bettinger, Jack Isabel — Contributing editors, Convair Edition

Calvin Franklin Achieves Success in Three Careers

By Victoria Butler

Hard work and determination have brought Calvin G. Franklin success in not one but three fields — business, military and academic.

In his first career, he has risen from a position as janitor at Convair to supervisor of engineering support services at Electronics.

In his second, he has been promoted from private to lieutenant colonel in the California Army National Guard — and was one of four National Guard officers selected from across the country to attend the prestigious Army War College at Carlisle Barracks, Pa. this fall.

And in his third career, utilizing the General Dynamics tuition assistance program, Mr. Franklin earned two degrees and is currently working on his doctorate in human behavior at the United States International Univ. in San Diego.

"I like my civilian job and my decision to pursue an extensive military career was made because I enjoy that work too — I like providing an environment which allows people to grow," he says.

Franklin began his career with General Dynamics 28 years ago, working as a janitor in the fabric and seat assembly department at Convair. Currently, he supervises the engineering technicians and the test laboratory at Electronics division and is responsible for the efforts of 65 engineers, technicians and administrators.

The same year he joined GD, Franklin enlisted in the California Army National Guard as a private. Later he attended Officers Candidate School, re-

ceiving his commission in 1954, and is presently commanding officer of the 240th Signal Battalion in Stanton, Calif.

Franklin believes education is a good way for managers to increase their skill and become more effective:

"I worked on a bachelor of science degree in electrical engineering at San Diego State Univ., but stopped after



Franklin

three years because I was already an engineer," he says. "Two years later, in 1970, I went back to school to earn a degree in management which is more in line with my current job assignment."

He subsequently has earned a master's degree in business management and has completed 70 percent of the work on his doctorate in human behavior.

"My schedule," he says, "is very busy."

Four High School Students Awarded \$500 Scholarships

Four outstanding high school seniors, children of Convair division employees, have been selected for \$500 Convair Management Association scholarship grants.

They are Cynthia J. Sedlund, Susan M. Gourley, Barbara L. Hazer, and Raymond Ting-Kang Su. The four — all 4.0 scholars — were among 51 applicants vying for the grants.

Jack Miller, Chapter Scholarship Awards Manager, presented the \$500 checks and award certificates June 3 during a banquet.

Miss Sedlund, daughter of Design Specialist Floyd R. Sedlund, ranked first in her class of 700 at Clairemont High School. She was president of the gymnastics team, a member of the planning committee for the Gifted Students' Conference and Associate Student Body representative. She plans to major in chemical engineering at either Stanford Univ., Princeton Univ. or the Univ. of California at San Diego.

Miss Gourley is the daughter of Construction Engineer Carl F. Gourley. She is a graduate of University High School and was ranked third in her class of more than 300. She is a member of the National Honor Society and the California State Scholarship Federation. Active in 4H Club activities and Science Fair projects, she plans to study veterinary medicine at the Univ. of California at Davis.

Miss Hazer, daughter of Calibration Technician Ervin J. Hazer, is also a graduate of University High. Her plans

Did You Know?

In 1942, women comprised nearly 40 percent of the work force at Consolidated Aircraft, a forerunner company of Convair division. At that time, PBY Catalina flying boats were in mass production.

are to major in biochemistry at either the Univ. of San Diego or the Univ. of California at San Diego.

Mr. Su, son of Senior Project Engineer Wellington T. Su, ranked 10th in his class of 700 at Clairemont High School. He is a member of the California Scholastic Federation. He was active in the Biology Club, the Chess Club and Science Fair competition. He plans to study engineering at the Univ. of California at San Diego.

Service Awards

FORTY YEARS —



N. F. LaGamma
Operations

THIRTY-FIVE YEARS —

Operations — S. Serrano, S. Boyd, M. L. Salefski, J. S. Butina, O. L. Hunley, J. S. Fisher, S. B. Ames, J. R. Nelson Jr., E. D. Booth, R. F. Yturralde, M. M. Lopez, W. J. Durflinger, R. E. Schmieder, L. W. Stamper, A. D. D'Ercle, R. B. Walling Jr., W. J. Carpinielli, J. C. Calhoun, C. F. Priddy, H. G. Blomke, N. E. Eldridge, J. Berardini, R. F. Missman, J. L. Ottman.

Finance — R. Barbat.

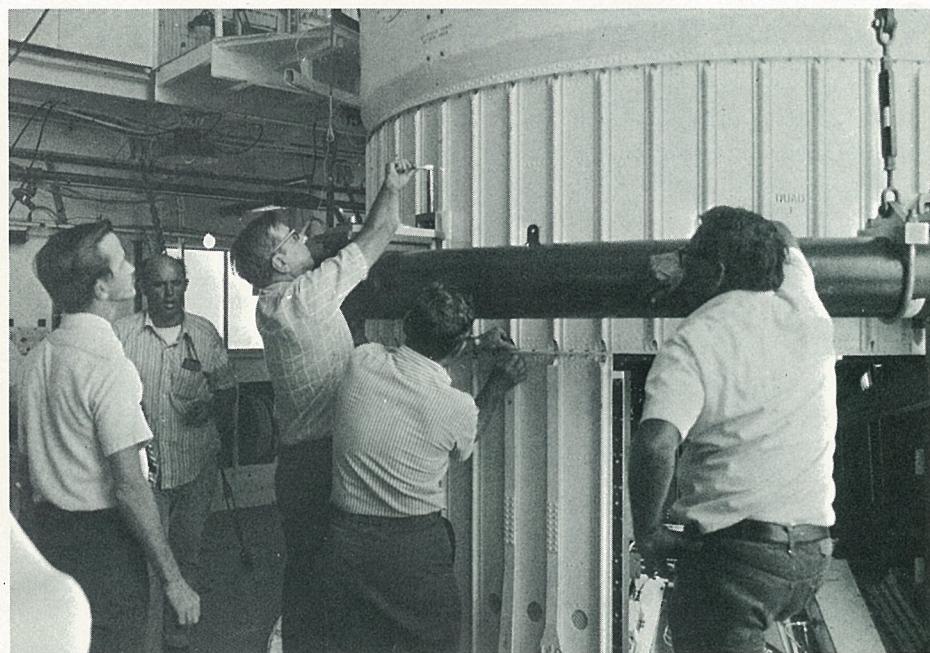
Research and Engineering — F. L. Cook, J. J. Arnieri, O. C. Priest, J. H. Struthers, R. J. Loesch.

Reliability — G. R. Bailey, G. D. Kline Jr., C. W. Koskinen.

Marketing — G. E. Putness.

Launch Vehicle Programs — S. C. Nelson.

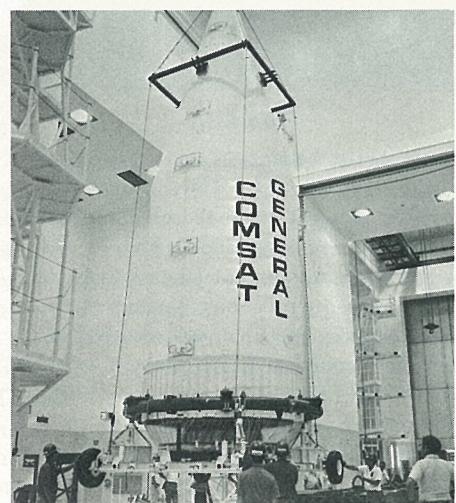
GD's Prelaunch Activity at Cape Canaveral . . .



Ring Removal. Convair division's Dan Schmidt, Bill Ten Eyke, Joe Jingle, Gerry Leonard and Jack Heath (left to right), are in process of removing the lifting ring following Comstar spacecraft and nose fairing mating to Atlas-Centaur launch vehicle at Cape Canaveral.



Erection Tasks. The Convair launch support team performs numerous functional checks after the spacecraft and nose fairing are mated to the launch vehicle. Dave Boshart is shown here carrying out final spacecraft erection tasks on the launch pad.



Lending A Hand. In the clean room where the communications satellite is encapsulated, Boshart, Schmidt, Joe Haser and Bill Ten Eyke lend a hand in loading the encapsulated Comstar spacecraft onto road transport trailer for trip to the launch complex.

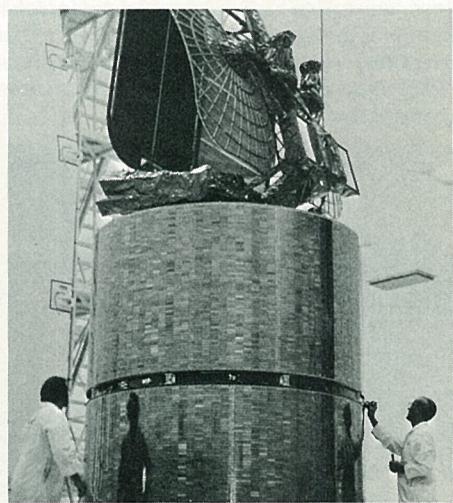
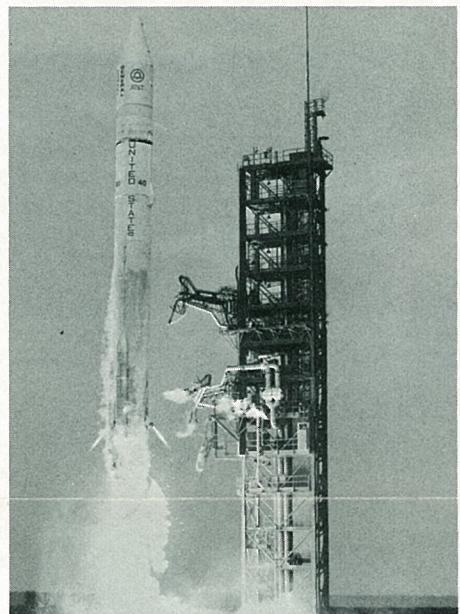
...Is More than Pressing a Button

An Atlas-Centaur rocket built by the company's Convair division successfully boosted the second Comstar communications satellite into orbit on July 22 (right). It will be positioned above the Equator over the Pacific Ocean.

The San Diego-built Atlas and Centaur have been the prime launch vehicles used to place communications satellites into orbit. The launch combination has placed seven Intelsat IV satellites on station, two larger and more powerful Intelsat IV-As and the two Comstars.

This series of photos shows there is more to launching a satellite than just pressing the "fire" button.

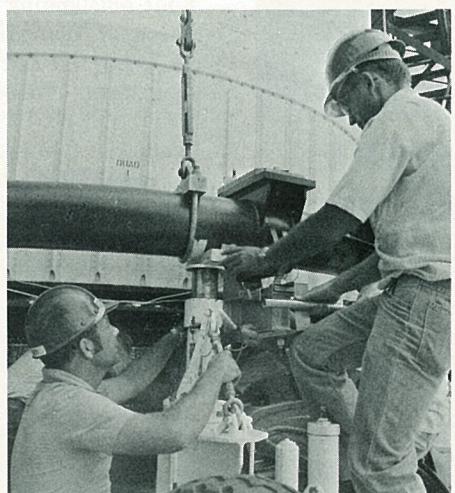
Involved is prelaunch preparation and, to Convair personnel assigned to Cape Canaveral over the years, it's become second nature.



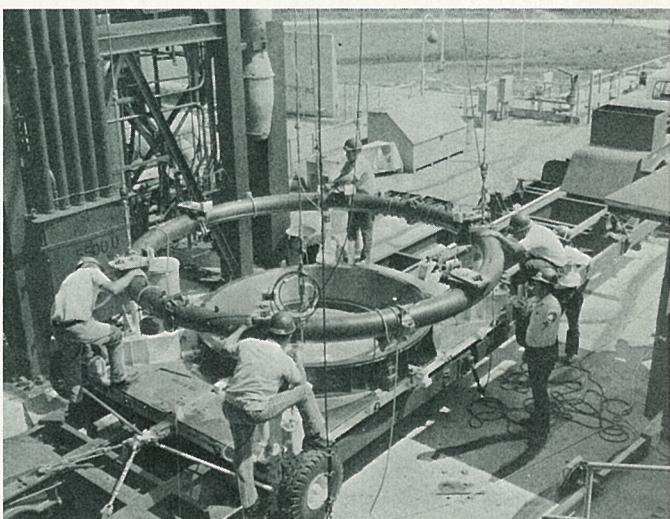
Final Checks. Hughes Aircraft Co. personnel perform final checkout tasks on the Comstar satellite prior to encapsulation. Hughes has delivered four Comstars. The third will be launched in 1978 while the fourth will serve as a ground spare.



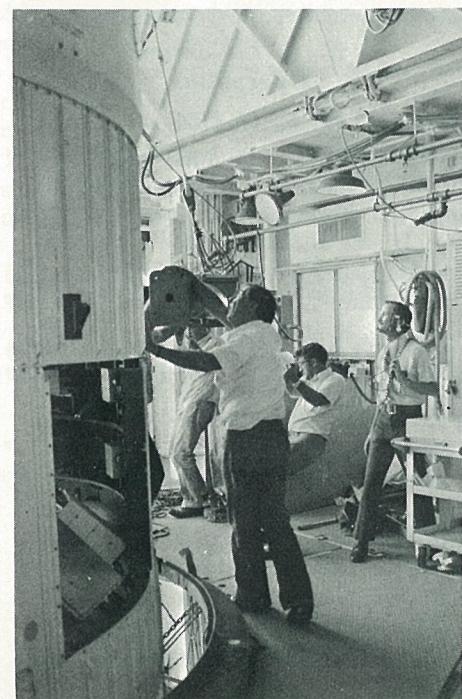
Vehicle Lift. Once the encapsulated Comstar communications satellite reaches the launch complex it has to be lifted to the launch vehicle for mating. Connecting the spacecraft erection sling are (left to right) Leonard, Boshart, Schmidt and Jingle.



Preparing the Assembly. Marv Tilley and Boshart prepare the spacecraft assembly for erection at Launch Complex 36 at Cape Canaveral. From encapsulation to mating with the launch vehicle is a three-day effort.



Securing a Ring. Boshart, Bob Folmer, Haser, Ten Eyke and Manuel Villar secure the lifting ring on a trailer following removal from the encapsulated Comstar. Once erected and mated the spacecraft is checked out prior to launch.



Final Processes. With their arms inside the peak of the nose fairing, Tilley and Boshart (above) cock the nose fairing jettison actuators prior to securing the access doors. At the left, Heath, Boshart and Schmidt are in process of removing the lifting ring from the service tower. Right, Gil Hart routes instrumentation harness to the spacecraft which is already bolted to the flight adapter.

